

CLEAN

Contract No. N62474-88-D-5086

Contract Task Order No. 0121

Modification No. 0001

Navy Remedial Project Managers: Gary J. Munekawa and George Kikugawa
PRC Installation Coordinator: Duane Balch
Montgomery Watson Remedial Project Manager: Kenneth Leung

NAVAL AIR STATION, ALAMEDA
ALAMEDA, CALIFORNIA

DATA SUMMARY REPORT
RI/FS PHASES 1 AND 2A

VOLUME I

FINAL

Prepared by:

PRC ENVIRONMENTAL MANAGEMENT, INC.
11030 White Rock Road, Suite 190
Rancho Cordova, CA 95670
916/852-8300

and

MONTGOMERY WATSON
365 Lennon Lane
Walnut Creek, CA 94598
510/975-3400

August 25, 1993

NAS ALAMEDA, CALIFORNIA

DATA SUMMARY REPORT
RI/FS PHASES 1 AND 2A
DRAFT
VOLUME I

TABLE OF CONTENTS

<u>Section</u>	<u>Page</u>
1.0 INTRODUCTION	1-1
1.1 PURPOSE	1-1
1.2 OVERALL REMEDIAL INVESTIGATION AND SWAT PROGRAMS	1-2
1.3 SITE DESCRIPTION	1-2
1.3.1 Location of NAS Alameda	1-3
1.3.2 Physiographic Setting/Climate	1-3
1.3.3 Operational History	1-3
1.4 REPORT OBJECTIVES	1-4
1.5 REPORT ORGANIZATION	1-4
2.0 REGIONAL CONCEPTUAL MODEL	2-1
2.1 REGIONAL GEOLOGY/HYDROGEOLOGY	2-1
2.2 GROUNDWATER OCCURRENCE	2-4
2.3 GROUNDWATER QUALITY	2-4
3.0 CRITERIA FOR PRELIMINARY DATA EVALUATION	3-1
3.1 ANALYTICAL DATA QUALITY CONSIDERATIONS	3-1
3.2 EVALUATION OF DATA FOR SOILS	3-2
3.3 EVALUATION OF DATA FOR GROUNDWATER	3-3
4.0 PHASES 1 AND 2A INVESTIGATIONS DESCRIPTION AND METHODS	4-1
4.1 FOCUS OF INVESTIGATION	4-2
4.2 CHEMICAL ANALYSES	4-2
5.0 SITE 1 - 1943-1956 DISPOSAL AREA	5-1
5.1 INTRODUCTION	5-1
5.2 SITE DESCRIPTION AND BACKGROUND	5-1
5.3 CURRENT USE	5-3
5.4 PREVIOUS INVESTIGATIONS	5-3
5.5 CANONIE INVESTIGATION	5-4
5.5.1 Site Geology/Hydrogeology	5-4
5.5.2 Analytical Results - Surface Soil Sampling	5-5
5.5.2.1 Semivolatile Organic Compounds	5-5
5.5.2.2 Total Recoverable Petroleum Hydrocarbons	5-5
5.5.2.3 Pesticides/PCBs	5-5
5.5.2.4 Metals	5-5
5.5.2.5 Radionuclides	5-6
5.5.3 Analytical Results - Subsurface Sampling	5-6
5.5.3.1 Volatile Organic Compounds	5-6
5.5.3.2 Semivolatile Organic Compounds	5-7
5.5.3.3 Pesticides/PCBs	5-7
5.5.3.4 Metals	5-7

TABLE OF CONTENTS

(Continued)

<u>Section</u>		<u>Page</u>
	5.5.3.5 Radionuclides	5-7
	5.5.3.6 Total Organic Carbon and pH	5-7
5.6	SUMMARY AND CONCLUSIONS	5-7
6.0	SITE 2 - WEST BEACH LANDFILL	6-1
6.1	INTRODUCTION	6-1
6.2	SITE DESCRIPTION AND BACKGROUND	6-1
6.3	CURRENT USE	6-2
6.4	PREVIOUS INVESTIGATIONS	6-2
6.5	CANONIE INVESTIGATION	6-3
	6.5.1 Site Geology/Hydrogeology	6-4
	6.5.2 Analytical Results - Soil Samples	6-5
	6.5.2.1 Volatile Organic Compounds	6-5
	6.5.2.2 Semivolatile Organic Compounds	6-5
	6.5.2.3 Pesticides/PCBs	6-5
	6.5.2.4 Metals	6-5
	6.5.2.5 General Chemical Characteristics	6-6
	6.5.2.6 Radionuclides	6-6
6.6	SUMMARY AND CONCLUSIONS	6-6
7.0	SITE 3 - AREA 97, ABANDONED FUEL STORAGE AREA	7-1
7.1	SITE DESCRIPTION AND BACKGROUND	7-1
7.2	CURRENT USE	7-1
7.3	PREVIOUS INVESTIGATIONS	7-1
	7.3.1 Kennedy Engineers, 1980	7-2
	7.3.2 Wahler Associates, 1985	7-2
7.4	REMEDIAL INVESTIGATION	7-3
	7.4.1 Site Geology/Hydrogeology	7-3
	7.4.2 Soil Gas Survey Results	7-4
	7.4.3 Analytical Results - Soil Samples	7-4
	7.4.3.1 Volatile Organic Compounds	7-5
	7.4.3.2 Semivolatile Organic Compounds	7-5
	7.4.3.3 Total Recoverable Petroleum Hydrocarbons	7-5
	7.4.3.4 Ethylene Dibromide	7-5
	7.4.3.5 Metals	7-5
	7.4.3.6 General Chemical Characteristics	7-6
	7.4.4 Analytical Results - Groundwater Samples	7-6
	7.4.4.1 Volatile Organic Compounds	7-6
	7.4.4.2 Semivolatile Organic Compounds	7-6
	7.4.4.3 Oil and Grease	7-7 7-6
	7.4.4.4 Ethylene Dibromide	7-7
	7.4.4.5 Metals	7-7
	7.4.4.6 General Chemical Characteristics	7-7
7.5	SUMMARY AND CONCLUSIONS	7-7
	7.5.1 Soil Gas Survey	7-8
	7.5.2 Soils	7-8
	7.5.3 Groundwater	7-9

TABLE OF CONTENTS (Continued)

<u>Section</u>		<u>Page</u>
8.0	SITE 4 - BUILDING 360, AIRCRAFT ENGINE FACILITY	8-1
8.1	SITE DESCRIPTION AND BACKGROUND	8-1
8.2	CURRENT USE	8-1
8.3	OTHER INVESTIGATIONS	8-1
	8.3.1 ERG Plating Shop Sampling	8-2
	8.3.2 PRC Team Plating Shop Investigation, 1992	8-2
	8.3.3 PRC Team Follow-On Plating Shop Investigation, 1992	8-4
8.4	REMEDIAL INVESTIGATION	8-5
	8.4.1 Site Geology/Hydrogeology	8-5
	8.4.2 Analytical Results - Soil Samples	8-5
	8.4.2.1 Volatile Organic Compounds	8-6
	8.4.2.2 Semivolatile Organic Compounds	8-6
	8.4.2.3 Metals	8-6
	8.4.2.4 General Chemical Characteristics	8-6
	8.4.3 Analytical Results - Groundwater Samples	8-6
	8.4.3.1 Volatile Organic Compounds	8-7
	8.4.3.2 Semivolatile Organic Compounds	8-7
	8.4.3.3 Metals	8-7
	8.4.3.4 General Chemical Characteristics	8-7
8.5	SUMMARY AND CONCLUSIONS	8-7
	8.5.1 Soils	8-8
	8.5.2 Groundwater	8-9
9.0	SITE 7C - BUILDING 547, SERVICE STATION	9-1
9.1	SITE DESCRIPTIONS AND BACKGROUND	9-1
9.2	CURRENT SITE USE	9-1
9.3	PREVIOUS INVESTIGATIONS	9-1
9.4	REMEDIAL INVESTIGATION	9-1
	9.4.1 Site Geology/Hydrogeology	9-2
	9.4.2 Soil Gas Survey Results	9-2
	9.4.3 Analytical Results - Soil Samples	9-3
	9.4.3.1 Volatile Organic Compounds	9-3
	9.4.3.2 Semivolatile Organic Compounds	9-3
	9.4.3.3 Total Recoverable Petroleum Hydrocarbons	9-3
	9.4.3.4 Pesticides/PCBs	9-4
	9.4.3.5 Ethylene Dibromide	9-4
	9.4.3.6 Metals	9-4
	9.4.3.7 General Chemical Characteristics	9-4
	9.4.4 Analytical Results - Groundwater Samples	9-5
	9.4.4.1 Volatile Organic Compounds	9-5
	9.4.4.2 Semivolatile Organic Compounds	9-5
	9.4.4.3 Total Recoverable Petroleum Hydrocarbons	9-5
	9.4.4.4 Metals	9-5
	9.4.4.5 General Chemical Characteristics	9-6
9.5	SUMMARY AND CONCLUSIONS	9-6
	9.5.1 Soil Gas Survey	9-6
	9.5.2 Soils	9-7
	9.5.3 Groundwater	9-8

TABLE OF CONTENTS
(Continued)

<u>Section</u>	<u>Page</u>
10.0 SITE 9 - BUILDING 410, PAINT STRIPPING	10-1
10.1 SITE DESCRIPTION AND BACKGROUND	10-1
10.2 CURRENT USE	10-1
10.3 PREVIOUS INVESTIGATIONS	10-1
10.4 REMEDIAL INVESTIGATION	10-1
10.4.1 Site Geology/Hydrogeology	10-2
10.4.2 Analytical Results - Soil Samples	10-2
10.4.2.1 Volatile Organic Compounds	10-2
10.4.2.2 Semivolatile Organic Compounds	10-3
10.4.2.3 Metals	10-3
10.4.2.4 General Chemical Characteristics	10-3
10.4.3 Analytical Results - Groundwater Samples	10-4
10.4.3.1 Volatile Organic Compounds	10-4
10.4.3.2 Semivolatile Organic Compounds	10-4
10.4.3.3 Metals	10-4
10.4.3.4 General Chemical Characteristics	10-5
10.5 SUMMARY AND CONCLUSIONS	10-5
10.5.1 Soils	10-5
10.5.2 Groundwater	10-6
11.0 SITE 10B - BUILDING 530, MISSILE REWORK OPERATIONS	11-1
11.1 SITE DESCRIPTION AND BACKGROUND	11-1
11.2 PREVIOUS INVESTIGATIONS	11-1
11.3 CURRENT USE	11-1
11.4 REMEDIAL INVESTIGATION	11-1
11.4.1 Geology/Hydrogeology	11-2
11.4.2 Analytical Results - Soil Samples	11-2
11.4.2.1 Volatile Organic Compounds	11-2
11.4.2.2 Semivolatile Organic Compounds	11-3
11.4.2.3 Total Recoverable Petroleum Hydrocarbons	11-3
11.4.2.4 Metals	11-3
11.4.2.5 General Chemical Characteristics	11-4
11.4.3 Analytical Results - Groundwater Samples	11-4
11.4.3.1 Volatile Organic Compounds	11-4
11.4.3.2 Semivolatile Organic Compounds	11-4
11.4.3.3 Petroleum Hydrocarbons	11-4
11.4.3.4 Metals	11-4
11.4.3.5 General Chemical Characteristics	11-5
11.5 SUMMARY AND CONCLUSIONS	11-5
11.5.1 Soils	11-5
11.5.2 Groundwater	11-7

TABLE OF CONTENTS
(Continued)

<u>Section</u>		<u>Page</u>
12.0	SITE 13 - FORMER OIL REFINERY	12-1
12.1	SITE DESCRIPTION AND BACKGROUND	12-1
12.2	OTHER INVESTIGATIONS	12-1
12.3	CURRENT USE	12-3
12.4	REMEDIAL INVESTIGATION	12-3
	12.4.1 Site Geology/Hydrogeology	12-3
	12.4.2 Analytical Results - Soil Samples	12-4
	12.4.2.1 Volatile Organic Compounds	12-4
	12.4.2.2 Semivolatile Organic Compounds	12-5
	12.4.2.3 Total Recoverable Petroleum Hydrocarbons	12-5
	12.4.2.4 Pesticides/PCBs	12-6
	12.4.2.5 Metals	12-6
	12.4.2.6 General Chemical Characteristics	12-6
	12.4.3 Analytical Results - Groundwater Samples	12-7
	12.4.3.1 Volatile Organic Compounds	12-7
	12.4.3.2 Semivolatile Organic Compounds	12-7
	12.4.3.3 Total Recoverable Petroleum Hydrocarbons	12-7
	12.4.3.4 Pesticides/PCBs	12-7
	12.4.3.5 Metals	12-7
	12.4.3.6 General Chemical Characteristics	12-8
12.5	SUMMARY AND CONCLUSIONS	12-8
	12.5.1 Soils	12-8
	12.5.2 Groundwater	12-10
13.0	SITE 16 - CANS C-2 AREA	13-1
13.1	SITE DESCRIPTION AND BACKGROUND	13-1
13.2	CURRENT USE	13-1
13.3	PREVIOUS INVESTIGATIONS	13-1
13.4	REMEDIAL INVESTIGATION	13-2
	13.4.1 Site Geology/Hydrogeology	13-2
	13.4.2 Analytical Results - Soil Samples	13-3
	13.4.2.1 Volatile Organic Compounds	13-3
	13.4.2.2 Semivolatile Organic Compounds	13-3
	13.4.2.3 Pesticides/PCBs and Herbicides	13-3
	13.4.2.4 Metals	13-4
	13.4.2.5 Total Organic Carbon, pH, and Cation Exchange Capacity	13-4
	13.4.2.6 General Chemical Characteristics	13-4
	13.4.3 Analytical Results - Groundwater Samples	13-5
	13.4.3.1 Volatile Organic Compounds	13-5
	13.4.3.2 Semivolatile Organic Compounds	13-5
	13.4.3.3 13.4.3.3 Metals	13-5
	13.4.3.4 13.4.3.4 Total Recoverable Petroleum Hydrocarbons	13-5
	13.4.3.5 General Chemical Characteristics	13-5
13.5	SUMMARY AND CONCLUSIONS	13-6
	13.5.1 Soils	13-6
	13.5.2 Groundwater	13-8

TABLE OF CONTENTS
(Continued)

<u>Section</u>	<u>Page</u>
14.0 SITE 19 - YARD D-13, HAZARDOUS WASTE STORAGE	14-1
14.1 SITE DESCRIPTIONS AND BACKGROUND	14-1
14.2 CURRENT USE	14-1
14.3 PREVIOUS INVESTIGATIONS	14-1
14.4 REMEDIAL INVESTIGATION	14-1
14.4.1 Site Geology/Hydrogeology	14-1
14.4.2 Analytical Results - Soil Samples	14-2
14.4.2.1 Volatile Organic Compounds	14-2
14.4.2.2 Semivolatile Organic Compounds	14-2
14.4.2.3 Total Recoverable Petroleum Hydrocarbons	14-3 14-2
14.4.2.4 Pesticides/PCBs	14-3
14.4.2.5 Total Organic Carbon	14-3
14.4.2.6 Metals	14-3
14.4.2.7 Cations/Anions and pH	14-3
14.4.2.8 General Chemical Characteristics	14-3
14.4.3 Analytical Results - Groundwater Samples	14-3
14.4.3.1 Volatile Organic Compounds	14-4
14.4.3.2 Semivolatile Organic Compounds	14-4
14.4.3.3 Total Recoverable Petroleum Hydrocarbons	14-4
14.4.3.4 Pesticides/PCBs	14-4
14.4.3.5 Metals	14-4
14.4.3.6 Total Organic Carbon, CEC, Dissolved Oxygen, and pH	14-4
14.4.3.7 General Chemical Characteristics	14-5
14.5 SUMMARY AND CONCLUSIONS	14-5
14.5.1 Soils	14-5
14.5.2 Groundwater	14-7
15.0 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS	15-1
15.1 APPLICABILITY OF REGULATORY REQUIREMENTS AT FEDERAL FACILITIES	15-1
15.2 DEFINITION AND DEVELOPMENT OF ARARs	15-1
15.3 ARARs DEVELOPMENT	15-2
15.3.1 Chemical-Specific ARARs	15-3
15.3.2 Location-Specific ARARs	15-3
15.3.3 Action-Specific ARARs	15-3
15.4 IDENTIFICATION OF CHEMICAL-SPECIFIC AND LOCATION-SPECIFIC ARARs	15-3

TABLE OF CONTENTS
(Continued)

<u>Section</u>	<u>Page</u>
16.0 PUBLIC HEALTH AND ENVIRONMENTAL EVALUATION	16-1
16.1 POTENTIAL RECEPTORS	16-1
16.1.1 Human Receptors	16-2
16.1.2 Terrestrial Organisms	16-2
16.1.3 Marine Organisms	16-2
16.2 POTENTIAL EXPOSURE PATHWAYS	16-2
16.2.1 Human and Terrestrial Organism Receptors	16-2
16.2.1.1 Drinking Water	16-3
16.2.1.2 Soil and Dust Ingestion	16-3
16.2.1.3 Inhalation of Dust	16-3
16.2.1.4 Inhalation of Vapors	16-3
16.2.1.5 Dermal Contact	16-4
16.2.2 Marine Organism Receptors	16-4
16.2.2.1 Ingestion	16-4
16.2.2.2 Dermal Contact	16-4
17.0 CONCLUSIONS AND RECOMMENDATIONS	17-1
17.1 CONCLUSIONS	17-1
17.1.1 Site 1 Soil - 1943-1956 Disposal Area	17-1
17.1.2 Site 2 Soil - West Beach Landfill	17-1
17.1.3 Site 3 Soil - Area 97, Abandoned Fuel Storage Area	17-2
17.1.4 Site 3 Groundwater - Area 97, Abandoned Fuel Storage Area	17-2
17.1.5 Site 4 Soil - Building 360, Aircraft Engine Facility	17-2
17.1.6 Site 4 Groundwater - Building 360, Aircraft Engine Facility	17-3
17.1.7 Site 7C Soil - Building 547, Service Station	17-3
17.1.8 Site 7C Groundwater - Building 547, Service Station	17-3
17.1.9 Site 9 Soil - Building 410, Paint Stripping	17-4
17.1.10 Site 9 Groundwater - Building 410, Paint Stripping	17-4
17.1.11 Site 10B Soil - Building 530, Missile Rework Operations	17-4
17.1.12 Site 10B Groundwater - Building 530, Missile Rework Operations	17-5
17.1.13 Site 13 Soil - Former Oil Refinery	17-5
17.1.14 Site 13 Groundwater - Former Oil Refinery	17-5
17.1.15 Site 16 Soil - CANS C-2 Area	17-6
17.1.16 Site 16 Groundwater - CANS C-2 Area	17-6
17.1.17 Site 19 Soil - Hazardous Waste Storage	17-7
17.1.18 Site 19 Groundwater - Hazardous Waste Storage	17-7
17.2 RECOMMENDATIONS	17-7 17-8
17.2.1 General Recommendations	17-8
17.2.2 Site-Specific Recommendations	17-8
17.2.2.1 Site 1 Soil - 1943-1956 Disposal Area	17-8
17.2.2.2 Site 2 Soil - West Beach Landfill	17-8 17-9
17.2.2.3 Site 3 Soil - Area 97, Abandoned Fuel Storage Area	17-9
17.2.2.4 Site 3 Groundwater - Area 97, Abandoned Fuel Storage Area	17-9
17.2.2.5 Site 4 Soil - Building 360, Aircraft Engine Facility	17-9
17.2.2.6 Site 4 Groundwater - Building 360, Aircraft Engine Facility	17-9 17-10
17.2.2.7 Site 7C Soil - Building 547, Service Station	17-10
17.2.2.8 Site 7C Groundwater - Building 547, Service Station	17-10
17.2.2.9 Site 9 Soil - Building 410, Paint Stripping	17-10

TABLE OF CONTENTS (Continued)

<u>Section</u>	<u>Page</u>
17.2.2.10 Site 9 Groundwater - Building 410, Paint Stripping	17-10
17.2.2.11 Site 10B Soil - Building 530, Missile Rework Operations . . .	17-10 17-11
17.2.2.12 Site 10B Groundwater - Building 530, Missile Rework Operations	17-11
17.2.2.13 Site 13 Soil - Former Oil Refinery	17-11
17.2.2.14 Site 13 Groundwater - Former Oil Refinery	17-11
17.2.2.15 Site 16 Soil - CANS C-2 Area	17-12
17.2.2.16 Site 16 Groundwater - CANS C-2 Area	17-12
17.2.2.17 Site 19 Soil - Hazardous Waste Storage	17-12
17.2.2.18 Site 19 Groundwater - Hazardous Waste Storage	17-12 17-13
 18.0 RESPONSE TO COMMENTS	 18-1

LIST OF ACRONYMS AND ABBREVIATIONS

VOLUME II

APPENDICES

- A REFERENCES
- B SHALLOW SOIL GAS INVESTIGATION
- C SOIL BORING LOGS AND MONITORING WELL CONSTRUCTION ~~DATA~~ DETAILS
- D GEOTECHNICAL LABORATORY SOIL TEST DATA

LIST OF FIGURES

Figure No.

- 1-1 Location Map
- 1-2 RI Sites Location Map
- 1-3 Draft Proposed Schedule for Implementation of Overall RI Program

- 2-1 Idealized Stratigraphic Column for Alameda Area
- 2-2 Basewide Geologic Cross Sections
- 2-3 Shoreline Circa 1900
- 2-4 Groundwater Contour Map of Phase 2A Sites, November 8, 1992-1990
- 2-5 Total Dissolved Solids (mg/l)

- 5-1 Site 1 - Canonie Boring and Surface Sampling Locations
- 5-2 Site 1 - Volatile and Semivolatile Organic Compounds in Soil
- 5-3 Site 1 - Pesticide and PCB Compounds, TRPH and Total Organic Carbon in Soil

- 6-1 Site 2 - Canonie Boring Locations
- 6-2 Site 2 - Volatile and Semivolatile Organic Compounds in Soil
- 6-3 Site 2 - Pesticide and PCB Compounds and Total Organic Carbon in Soil

- 7-1 Site 3 - Kennedy and Wahler Trench and Monitoring Well Locations
- 7-2 Site 3 - Soil Gas Survey Points and Monitoring Well Locations
- 7-3 Site 3 - Geologic Cross Section A-A'
- 7-4 Site 3 - Benzene Concentrations from Soil Gas Survey
- 7-5 Site 3 - THC Concentrations from Soil Gas Survey
- 7-6 Site 3 - Volatile and Semivolatile Organic Compounds and TRPH in Soil
- 7-7 Site 3 - General Chemical Characteristics in Soil
- 7-8 Site 3 - Metals and General Chemical Characteristics in Groundwater

- 8-1 Site 4 - Canonie Boring and Monitoring Well Locations
- 8-2 Site 4 - Geologic Cross Section A-A', B-B'
- 8-3 Site 4 - Volatile and Semivolatile Organic Compounds in Soil
- 8-4 Site 4 - Total Organic Carbon and Cyanide in Soil
- 8-5 Site 4 - Volatile and Semivolatile Organic Compounds in Groundwater
- 8-6 Site 4 - Metals in Groundwater
- 8-7 Site 4 - TRPH and Total Organic Carbon in Groundwater
- 8-8 Site 4 - General Chemical Characteristics of Groundwater

- 9-1 Site 7C - Canonie Boring and Monitoring Well Locations, and Soil Gas Survey Point Locations
- 9-2 Site 7C - Geologic Cross Section A-A', B-B'
- 9-3 Site 7C - Benzene Concentrations from Soil Gas Survey
- 9-4 Site 7C - Ethylene Dibromide and Volatile Organic Compounds (excluding BTEX) in Soil
- 9-5 Site 7C - Volatile Organic Compounds (BTEX) in Soil
- 9-6 Site 7C - Semivolatile Organic Compounds (PAH) in Soil
- 9-7 Site 7C - Semivolatile Organic Compounds (excluding PAH) in Soil
- 9-8 Site 7C - TRPH and Total Organic Carbon in Soil
- 9-9 Site 7C - Pesticide Compounds in Soil
- 9-10 Site 7C - Volatile and Semivolatile Organic Compounds and TRPH in Groundwater
- 9-11 Site 7C - Metals in Groundwater

LIST OF FIGURES

Figure No.

- 9-12 Site 7C - General Chemical Characteristics of Groundwater

- 10-1 Site 9 - Canonie Boring and Monitoring Well Locations
- 10-2 Site 9 - Geologic Cross Section A-A', B-B'
- 10-3 Site 9 - Volatile Organic Compounds, pH, CEC, and Total Organic Carbon in Soil
- 10-4 Site 9 - Semivolatile Organic Compounds in Soil
- 10-5 Site 9 - Volatile Organic Compounds and Metals in Groundwater
- 10-6 Site 9 - General Chemical Characteristics of Groundwater

- 11-1 Site 10B - Canonie Monitoring Well Locations
- 11-2 Site 10B - Geologic Cross Section A-A'
- 11-3 Site 10B - Volatile and Semivolatile Organic Compounds and TRPH in Soil
- 11-4 Site 10B - Volatile and Semivolatile Organic Compounds, TRPH and Oil and Grease in Groundwater
- 11-5 Site 10B - Metals in Groundwater
- 11-6 Site 10B - General Chemical Characteristics of Groundwater

- 12-1 Site 13 - Historical Structures Pacific Coast Oil Refinery Circa 1897
- 12-2 Site 13 - Intermediate Maintenance Facility, Soil Boring and Monitoring Well Locations, 1989 HLA Investigation
- 12-3 Site 13 - Intermediate Maintenance Facility, Soil Boring and Monitoring Well Locations, Phases I and III Investigations
- 12-4 Site 13 - Canonie Boring and Monitoring Well Locations
- 12-5 Site 13 - Geologic Fence Diagram A-A'-A"
- 12-6 Site 13 - Selected Volatile Organic Compounds in Soil
- 12-7 Site 13 - BTEX and Other Selected Volatile Organic Compounds in Soil
- 12-8 Site 13 - Semivolatile Organic Compounds (PAH) in Soil
- 12-9 Site 13 - Semivolatile Organic Compounds (excluding PAH) in Soil
- 12-10 Site 13 - Total Recoverable Petroleum Hydrocarbons in Soil
- 12-11 Site 13 - ~~Pesticide Compounds in Soil~~ Pesticide and PCB Compounds in Soil
- 12-12 Site 13 - Total Organic Carbon and pH in Soil
- 12-13 Site 13 - Volatile and Semivolatile Organic Compounds, TRPH, and Pesticide and PCB Compounds in Groundwater
- 12-14 Site 13 - Metals in Groundwater
- 12-15 Site 13 - General Chemical Characteristics of Groundwater

- 13-1 Site 16 - Canonie Boring, Surface Sample and Monitoring Well Locations
- 13-2 Site 16 - Geologic Cross Section A-A'
- 13-3 Site 16 - Volatile Organic Compounds in Soil
- 13-4 Site 16 - Semivolatile Organic Compounds in Soil
- 13-5 Site 16 - Pesticide and PCB Compounds and Glyphosate in Soil
- 13-6 Site 16 - Volatile Organic Compounds in Groundwater
- 13-7 Site 16 - Metals in Groundwater
- 13-8 Site 16 - General Chemical Characteristics of Groundwater

- 14-1 Site 19 - Canonie Boring and Monitoring Well Locations
- 14-2 Site 19 - Geologic Cross Section A-A', B-B'

LIST OF FIGURES

**Figure
No.**

- | | |
|------|---|
| 14-3 | Site 19 - Volatile Organic Compounds in Soil |
| 14-4 | Site 19 - Semivolatile Organic Compounds in Soil |
| 14-5 | Site 19 - Total Recoverable Petroleum Hydrocarbons in Soil |
| 14-6 | Site 19 - Pesticide and PCB Compounds and Total Organic Carbon in Soil |
| 14-7 | Site 19 - Volatile Organic Compounds, Pesticide Compounds, TRPH and Oil and Grease in Groundwater |
| 14-8 | Site 19 - Metals in Groundwater |
| 14-9 | Site 19 - General Chemical Characteristics of Groundwater |

LIST OF TABLES

Table No.	
2-1	Classification of Water by TDS and Specific Conductivity
2-2	Water Quality Data for Shallow Groundwater Monitoring Wells
3-1	Background Borings - Statistical Analysis of Metals Results for Soil Samples
3-2	Native Soil Concentrations of Various Elements
3-3	Background Borings - Statistical Analysis of Metals Results for Groundwater Samples
3-4	Natural Concentrations of Various Elements in Groundwater
4-1	Site-Specific Laboratory Analyses for Soil
4-2	Site-Specific Laboratory Analyses for Groundwater
4-3	Detectable Analytes per Analytical Method
5-1	Site 1 - Summary of Laboratory Analyses Performed on Soil Samples
5-2	Site 1 - Geotechnical Sample Laboratory Test Results
5-3	Site 1 - Results for Volatile Organic Compounds Detected in Soil Samples
5-4	Site 1 - Results for Semivolatile Organic Compounds Detected in Soil Samples
5-5	Site 1 - Results for Total Recoverable Petroleum Hydrocarbons, Total Organic Carbon and pH Detected in Soil Samples
5-6	Site 1 - Results for Pesticide and PCB Compounds Detected in Soil Samples
5-7	Site 1 - Results for Metals Detected in Soil Samples
5-8	Site 1 - Results for Radionuclides Detected in Soil Samples
6-1	Site 2 - Summary of Laboratory Analyses Performed on Soil Samples
6-2	Site 2 - Geotechnical Sample Laboratory Test Results
6-3	Site 2 - Results for Volatile Organic Compounds Detected in Soil Samples
6-4	Site 2 - Results for Semivolatile Organic Compounds and Pesticides and PCB Compounds Detected in Soil Samples
6-5	Site 2 - Results for Metals Detected in Soil Samples
6-6	Site 2 - Results for General Chemical Characteristics in Soil Samples
6-7	Site 2 - Results for Radionuclides Detected in Soil Samples
7-1	Site 3 - Summary of Laboratory Analyses Performed on Soil and Groundwater Samples
7-2	Site 3 - Geotechnical Sample Laboratory Test Results
7-3	Site 3 - Soil Gas Survey Results
7-4	Site 3 - Results for Volatile Organic Compounds Detected in Soil Samples
7-5	Site 3 - Results for Semivolatile Organic Compounds Detected in Soil Samples
7-6	Site 3 - Results for Total Recoverable Petroleum Hydrocarbons Detected in Soil Samples
7-7	Site 3 - Results for Metals Detected in Soil Samples
7-8	Site 3 - Results for General Chemical Characteristics in Soil Samples
7-9	Site 3 - Results for Volatile Organic Compounds Detected in Groundwater Samples
7-10	Site 3 - Results for Metals Detected in Groundwater Samples
7-11	Site 3 - Results for General Chemical Characteristics in Groundwater Samples
8-1	Site 4 - Geotechnical Sample Laboratory Test Results
8-2	Site 4 - Summary of Laboratory Analyses Performed on Soil and Groundwater Samples
8-3	Site 4 - Results for Volatile Organic Compounds Detected in Soil Samples

LIST OF TABLES

Table No.

8-4	Site 4 - Results for Semivolatile Organic Compounds Detected in Soil Samples
8-5	Site 4 - Results for Metals Detected in Soil Samples
8-6	Site 4 - Results for General Chemical Characteristics in Soil Samples
8-7	Site 4 - Results for Volatile and Semivolatile Organic Compounds Detected in Groundwater Samples
8-8	Site 4 - Results for Metals Detected in Groundwater Samples
8-9	Site 4 - Results for General Chemical Characteristics in Groundwater Samples
9-1	Site 7C - Summary of Laboratory Analyses Performed on Soil and Groundwater Samples
9-2	Site 7C - Geotechnical Sample Laboratory Test Results
9-3	Site 7C - Soil Gas Survey Results
9-4	Site 7C - Results for Volatile Organic Compounds and Ethylene Dibromide Detected in Soil Samples
9-5	Site 7C - Results for Semivolatile Organic Compounds Detected in Soil Samples
9-6	Site 7C - Results for Total Recoverable Petroleum Hydrocarbons Detected in Soil Samples
9-7	Site 7C - Results for Pesticide and PCB Compounds Detected in Soil Samples
9-8	Site 7C - Results for Metals Detected in Soil Samples
9-9	Site 7C - Results for General Chemical Characteristics in Soil Samples
9-10	Site 7C - Results for Volatile Organic Compounds Detected in Groundwater Samples
9-11	Site 7C - Results for Semivolatile Organic Compounds and Total Recoverable Petroleum Hydrocarbons in Groundwater Samples
9-12	Site 7C - Results for Metals Detected in Groundwater Samples
9-13	Site 7C - Results for General Chemical Characteristics in Groundwater Samples
10-1	Site 9 - Summary of Laboratory Analyses Performed on Soil and Groundwater Samples
10-2	Site 9 - Geotechnical Sample Laboratory Test Results
10-3	Site 9 - Results for Volatile Organic Compounds Detected in Soil Samples
10-4	Site 9 - Results for Semivolatile Organic Compounds Detected in Soil Samples
10-5	Site 9 - Results for Metals Detected in Soil Samples
10-6	Site 9 - Results for General Chemical Characteristics in Soil Samples
10-7	Site 9 - Results for Volatile Organic Compounds Detected in Groundwater Samples
10-8	Site 9 - Results for Metals Detected in Groundwater Samples
10-9	Site 9 - Results for General Chemical Characteristics in Groundwater Samples
11-1	Site 10B - Summary of Laboratory Analyses Performed on Soil and Groundwater Samples
11-2	Site 10B - Geotechnical Sample Laboratory Test Results
11-3	Site 10B - Results for Volatile and Semivolatile Organic Compounds Detected in Soil Samples
11-4	Site 10B - Results for Total Recoverable Petroleum Hydrocarbons Detected in Soil Samples
11-5	Site 10B - Results for Metals Detected in Soil Samples
11-6	Site 10B - Results for General Chemical Characteristics in Soil Samples
11-7	Site 10B - Results for Volatile Organic Compounds Detected in Groundwater Samples
11-8	Site 10B - Results for Semivolatile Organic Compounds and Petroleum Hydrocarbons Detected in Groundwater Samples
11-9	Site 10B - Results for Metals Detected in Groundwater Samples
11-10	Site 10B - Results for General Chemical Characteristics in Groundwater Samples
12-1	Site 13 - Summary of Laboratory Analyses Performed on Soil and Groundwater Samples
12-2	Site 13 - Geotechnical Sample Laboratory Test Results
12-3	Site 13 - Results for Volatile Organic Compounds Detected in Soil Samples

LIST OF TABLES

Table No.

12-4	Site 13 - Results for Semivolatile Organic Compounds Detected in Soil Samples
12-5	Site 13 - Results for Total Recoverable Petroleum Hydrocarbons Detected in Soil Samples
12-6	Site 13 - Results for Pesticide Compounds Detected in Soil Samples
12-7	Site 13 - Results for Metals Detected in Soil Samples
12-8	Site 13 - Results for General Chemical Characteristics in Soil Samples
12-9	Site 13 - Results for Volatile Organic Compounds Detected in Groundwater Samples
12-10	Site 13 - Results for Semivolatile Organic Compounds, Total Recoverable Petroleum Hydrocarbons and Pesticide Compounds Detected in Groundwater Samples
12-11	Site 13 - Results for Metals Detected in Groundwater Samples
12-12	Site 13 - Results for General Chemical Characteristics in Groundwater Samples
13-1	Site 16 - Geotechnical Sample Laboratory Test Results
13-2	Site 16 - Summary of Laboratory Analyses Performed on Soil and Groundwater Samples
13-3	Site 16 - Results for Volatile Organic Compounds Detected in Soil Samples
13-4	Site 16 - Results for Semivolatile Organic Compounds Detected in Soil Samples
13-5	Site 16 - Results for Pesticide and PCB Compounds and Glyphosate Detected in Soil Samples
13-6	Site 16 - Results for Metals Detected in Soil Samples
13-7	Site 16 - Results for Total Organic Carbon, pH and Cations/Anions Detected in Soil Samples
13-8	Site 16 - Results for General Chemical Characteristics in Soil Samples
13-9	Site 16 - Results for Volatile Organic Compounds and Total Organic Carbon Detected in Groundwater Samples
13-10	Site 16 - Results for Metals Detected in Groundwater Samples
13-11	Site 16 - Results for Dissolved Oxygen, pH and Specific Conductivity Detected in Groundwater Samples
13-12	Site 16 - Results for General Chemical Characteristics in Groundwater Samples
14-1	Site 19 - Geotechnical Sample Laboratory Test Results
14-2	Site 19 - Summary of Laboratory Analyses Performed on Soil and Groundwater Samples
14-3	Site 19 - Results for Volatile Organic Compounds Detected in Soil Samples
14-4	Site 19 - Results for Semivolatile Organic Compounds Detected in Soil Samples
14-5	Site 19 - Results for Total Recoverable Petroleum Hydrocarbons Detected in Soil Samples
14-6	Site 19 - Results for Total Organic Carbon and Pesticide Compounds Detected in Soil Samples
14-7	Site 19 - Results for Metals Detected in Soil Samples
14-8	Site 19 - Results for pH and Cations/Anions Detected in Soil Samples
14-9	Site 19 - Results for General Chemical Characteristics in Soil Samples
14-10	Site 19 - Results for Volatile Organic, Pesticide, and Hydrocarbon Compounds and Total Organic Carbon Detected in Groundwater Samples
14-11	Site 19 - Results for Metals Detected in Groundwater Samples
14-12	Site 19 - Results for General Chemical Characteristics in Groundwater Samples
15-1	Potential Chemical-Specific ARARs
16-1	Potential Pathways Analysis

LIST OF ACRONYMS AND ABBREVIATIONS

AAL	Applied Action Level
ACTESOLV	Aquifer Test Solver
ARARs	Applicable or Relevant and Appropriate Requirements
AVGAS	Aviation Gasoline
BAAQMD	Bay Area Air Quality Management District
bgs	Below Ground Surface
BOD	Biological Oxygen Demand
BTEX	Benzene, Toluene, Ethylbenzene, and Xylenes
BTU	British Thermal Units
CaCO ₃	Calcium Carbonate
CAD	Computer-Aided Design
CAM	California Assessment Metals
CDMG	California Division of Mines and Geology
CEC	Cation Exchange Capacity
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CLEAN	Comprehensive Long-Term Environmental Action Navy
CLP	Contract Laboratory Program
cm	Centimeter
cm/s	Centimeter per Second
COD	Chemical Oxygen Demand
CS	Confirmation Study; Ortho-Chlorobenzylidene Malononitrile
CSC	2-Chlorophenol Methylene
CTO	Contract Task Order
DCA	Dichloroethane
DCE	Dichloroethene
DDE	Dichlorodiphenyldichloroethene
DDD	1,1-Dichloro-2,2-bis(p-chlorophenyl)ethane
DDT	Dichlorodiphenyltrichloroethane
DHS	Department of Health Services (California)
DO	Dissolved Oxygen
DOD	Department of Defense
DQO	Data Quality Objective
DTSC	Department of Toxic Substances Control (California)
2,4-D	2,4-Dichlorophenoxyacetic acid
E&E	Ecology & Environment, Inc.
EBMUD	East Bay Municipal Utility District
EDB	Ethylene Dibromide
EPA	Environmental Protection Agency
ERG	Environmental Research Group, Inc.
ft	Foot or Feet
FS	Feasibility Study
HLA	Harding Lawson Associates
IAS	Initial Assessment Study
IMF	Intermediate Maintenance Facility
JMM	James M. Montgomery, Consulting Engineers, Inc.
K	Statistical Tolerance Interval
kg	Kilogram
L	Liter

ACRONYMS AND ABBREVIATIONS

(Continued)

LUFT	Leaking Underground Fuel Tank
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
mg	Milligram
ml	Milliliter
NA	Not Analyzed
NACIP	Naval Assessment and Control of Installation Pollutants
NARF	Naval Air Rework Facility
NAS	Naval Air Station
NCP	National Contingency Plan
NEESA	Naval Energy and Environmental Support Activity
NIOSH	National Institute for Occupational Safety and Health
NORM	Naturally Occurring Radioactive Materials
PAH	Polycyclic Aromatic Hydrocarbons
PARCC	Precision, Accuracy, Representativeness, Completeness, and Comparability
PCB	Polychlorinated Biphenyl
PCE	Tetrachloroethene
pcf	Pounds per Cubic Foot
pCi	Picocuries
PH EE	Public Health and Environmental Evaluation
ppm	Parts per Million
PRC	PRC Environmental Management, Inc.
PVC	Polyvinyl Chloride
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
QCP	Quality Control Plan
RI	Remedial Investigation
RPD	Relative Percent Difference
RWQCB	Regional Water Quality Control Board (California)
SAL	State Action Level
SARA	Superfund Amendments and Reauthorization Act
SPHEM	Superfund Public Health Evaluation Manual
SPRR	Southern Pacific Railroad
SVOC	Semivolatile Organic Compound
SWAT	Solid Waste Water Quality Assessment Test
SWRCB	State Water Resources Control Board
TBC	"To Be Considered"
TCA	Trichloroethane
TCE	Trichloroethene
TCLP	Toxic Characteristic Leaching Procedure
TDS	Total Dissolved Solids
THC	Total Hydrocarbons
TKN	Total Kjeldahl Nitrogen
TOC	Total Organic Carbon
TPH	Total Petroleum Hydrocarbons
TRPH	Total Recoverable Petroleum Hydrocarbons

ACRONYMS AND ABBREVIATIONS
(Continued)

U.S.	United States
USGS	United States Geological Survey
UST	Underground Storage Tank
VOC	Volatile Organic Compound
WESTDIV	Western Division
WQC	Water Quality Criteria
μg	Microgram
μmhos	Micromhos
μmhos/cm	Micromhos per Centimeter

1.0 INTRODUCTION

1.1 PURPOSE

This Data Summary Report presents the results of an investigation performed by Canonie Environmental Services Inc. (Canonie) at the Naval Air Station (NAS) Alameda, in Alameda, California. The investigation was performed by Canonie during 1990 under the Comprehensive Long-Term Environmental Action Navy (CLEAN) program. This report was generated by James M. Montgomery, Consulting Engineers, Inc. (JMM) and PRC Environmental Management, Inc. (PRC), referred to herein as the PRC team, under Contract No. N62474-88-D5086, Contract Task Order No. 0121, Contract Modification No. 0001. The Canonie investigation was undertaken in response to the June 6, 1988 Remedial Action Order (Order) received by the Navy from the California Department of Health Services (DHS), now known as the Department of Toxic Substances Control (DTSC). The Order required that the Navy perform a remedial investigation and feasibility study (RI/FS) at 20 sites at NAS Alameda, which is located on the east side of San Francisco Bay (Figure 1-1). The 20 sites identified in the Order are as shown on Figure 1-2.

The Navy undertook the RI/FS at the 20 sites using a phased approach as described below. Figure 1-3 presents the current implementation schedule for the phased program.

<u>Phase</u>	<u>Description</u>	<u>Sites Investigated</u>
Phases 1 and 2A	Field investigation and data summary report	Sites 1 (partial), 2 (partial), 3, 4 (partial), 7C, 9, 10B, 13, 16, and 19
Phases 2B and 3	Field investigation and data summary report	Sites 4 (partial), 5, 6, 7A, 7B, 8, 10A, 11, 12, 14, and 15
Phase 4	Ecological assessment	Sites 17 and 20
Phases 5 and 6	Solid Waste Water Quality Assessment Test (SWAT) investigation	Sites 1 and 2 (1943-1956 Disposal Area and West Beach Landfill)
Phase 7	Comprehensive RI report	All sites
Phase 8	FS report	All sites

This report presents the results of the ten site investigations conducted by Canonie in 1990 as part of Phases 1 and 2A. The Phases 1 and 2A investigations were performed as described in the work plans prepared by Canonie, Volumes 1 through 8 (Canonie, 1988, 1989a through 1989c, 1990a through 1990d). These work plans were prepared to comply with the remedial investigation guidance developed by the U.S. Environmental Protection Agency (EPA) under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA).

Ten of the 20 sites were included in the Phases 2B and 3 investigations. A final Data Summary Report for Phases 2B and 3 was submitted to the DTSC in October 1992 (PRC/JMM, 1992a). Two offshore areas identified in the Order will be included in a future ecological assessment investigation that is being performed as Phase 4. This investigation is planned to commence in late 1992. Phases 5 and 6 consist of a SWAT report for former landfills at Sites 1 and 2; the draft final of the SWAT report was submitted to the DTSC for review in September 1992. Phases 7 and 8 will consist of the comprehensive RI/FS reports that are tentatively scheduled to be initiated after completion of additional investigations for these 20 sites (to be conducted in early 1993).

1.2 OVERALL REMEDIAL INVESTIGATION

Prior to receipt of the Order, the Navy had begun investigations at NAS Alameda under the Naval Assessment and Control of Installation Pollutants (NACIP) program. Under the NACIP program, an initial assessment study (IAS) was conducted by Ecology & Environment, Inc. (E&E) in 1983. A confirmation study (CS) was then performed by Wahler Associates (Wahler) at sites identified for further study in the IAS (1985). The results of the IAS and CS investigations are summarized for each Phases 1 and 2A site in Sections 5 through 14 of this report.

In 1988, the Navy retained Canonie to review the DTSC and EPA comments on the IAS and CS reports, and to develop a work plan to satisfy CERCLA guidance for remedial investigations. Canonie prepared work plans for investigations at sites identified for further study in the CS (Wahler, 1985). These plans, including a sampling plan, quality assurance project plan, and a health and safety plan, were approved by the DTSC (Canonie, 1988, 1989a through 1989c, 1990a through 1990d).

1.3 SITE DESCRIPTION

This section describes the location, physiographic setting/climate, and history of NAS Alameda. Information regarding the regional geology and hydrogeology is presented in Section 2, Regional Conceptual Model.

1.3.1 Location of NAS Alameda

NAS Alameda lies on the western end of Alameda Island, in Alameda and San Francisco counties (Figure 1-1). Alameda Island lies along the eastern side of the San Francisco Bay, adjacent to the city of Oakland. The base, rectangular in shape, is approximately 2 miles long and 1 mile wide, and occupies 2,634 acres. Approximately 1,526 acres of NAS Alameda are above water; 1,108 acres are below water.

1.3.2 Physiographic Setting/Climate

Alameda Island is located within the San Francisco Bay basin, which lies within the Coast Range physiographic province of California. The island lies at the foot of a gently westward-sloping plain that extends from the Oakland/Berkeley hills on the east to the shore of the San Francisco Bay on the west. Originally a peninsula, Alameda Island was detached from the mainland in 1876 when a channel was cut linking San Leandro Bay and San Francisco Bay. The channel was later dredged to allow access for commercial ship traffic to and from the island's early industrial sites.

The San Francisco Bay area experiences a maritime climate with mild summer and winter temperatures. Rainfall occurs primarily during the months of October through April. Due to the varied topography of the bay area, climatic conditions vary considerably throughout the region. NAS Alameda averages approximately 18 inches per year of rainfall (Air Traffic Control NAS Alameda, 1992). The area has been experiencing drought conditions since 1987; thus, precipitation has been below normal levels.

1.3.3 Operational History

Prior to 1930, at least two large industrial sites, a borax processing plant and an oil refinery, were located on the island near what is now the eastern end of NAS Alameda (Sanborn, 1897). The refinery was located at the site of the present-day Site 13; the borax plant was located on what is now the southeastern corner of Atlantic and Eighth Streets, near present-day Site 3 (Figure 1-2). The 1899 U.S. Geological Survey (USGS) San Francisco Quadrangle (1:62,500) shows the Southern Pacific Railroad (SPRR) narrow-gauge spur extending along the southern side of the present Oakland Inner Harbor.

The U.S. Army acquired the NAS site from the City of Alameda in 1930 and began construction activities in 1931. In 1936, the U.S. Navy acquired title to the land from the Army and began building the air station in response to the military buildup in Europe prior to World War II. The air station is largely constructed on hydraulic fill material, as discussed in Section 2.1. The Navy constructed NAS Alameda south of the SPRR narrow-gauge spur, which was used as the northern breakwater for the air station. After the U.S.

entered into World War II in 1941, more land was acquired adjacent to the air station. Following the end of the war, NAS Alameda returned to its original primary mission of providing facilities and support for fleet aviation activities.

Currently, the western portion of the air station is primarily developed with runways and support facilities. The western ends of the main runways are on top of the 1943-1956 Disposal Area (Site 1). A portion of the West Beach Landfill (Site 2) is now a wetland. The Phase 2A sites, Sites 3, 4 (partial), 7C, 9, 10B, 13, 16, and 19, are located in the southeast corner of the air station and contain offices, residences, and industrial facilities.

1.4 REPORT OBJECTIVES

This report is intended to transmit the available data collected by Canonie for the Phase 1 and 2A sites and to provide initial interpretations that will be the basis for evaluating the conditions at the sites, and the need for possible additional investigations. Because the full quality assurance/quality control (QA/QC) evaluation of chemical analysis required for data validation was not available at the time this report was prepared, the Phases 1 and 2A data have not been validated. Therefore, this report presents the results as a qualitative assessment of the data with recommendations for future work to obtain additional data for the RI/FS evaluation. The Navy is currently evaluating options to address the QA/QC data issues. In order to perform a qualitative assessment of the data and to develop recommendations for future work to obtain additional data necessary for the RI/FS evaluation, a set of preliminary data evaluation criteria have been developed and are presented in Section 3. These criteria were developed for the purpose of assessing Canonie's data and are not the proposed remediation goals. The final remediation goals will be developed based on the risk assessment to be conducted during the comprehensive RI/FS process.

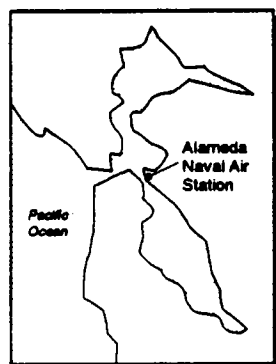
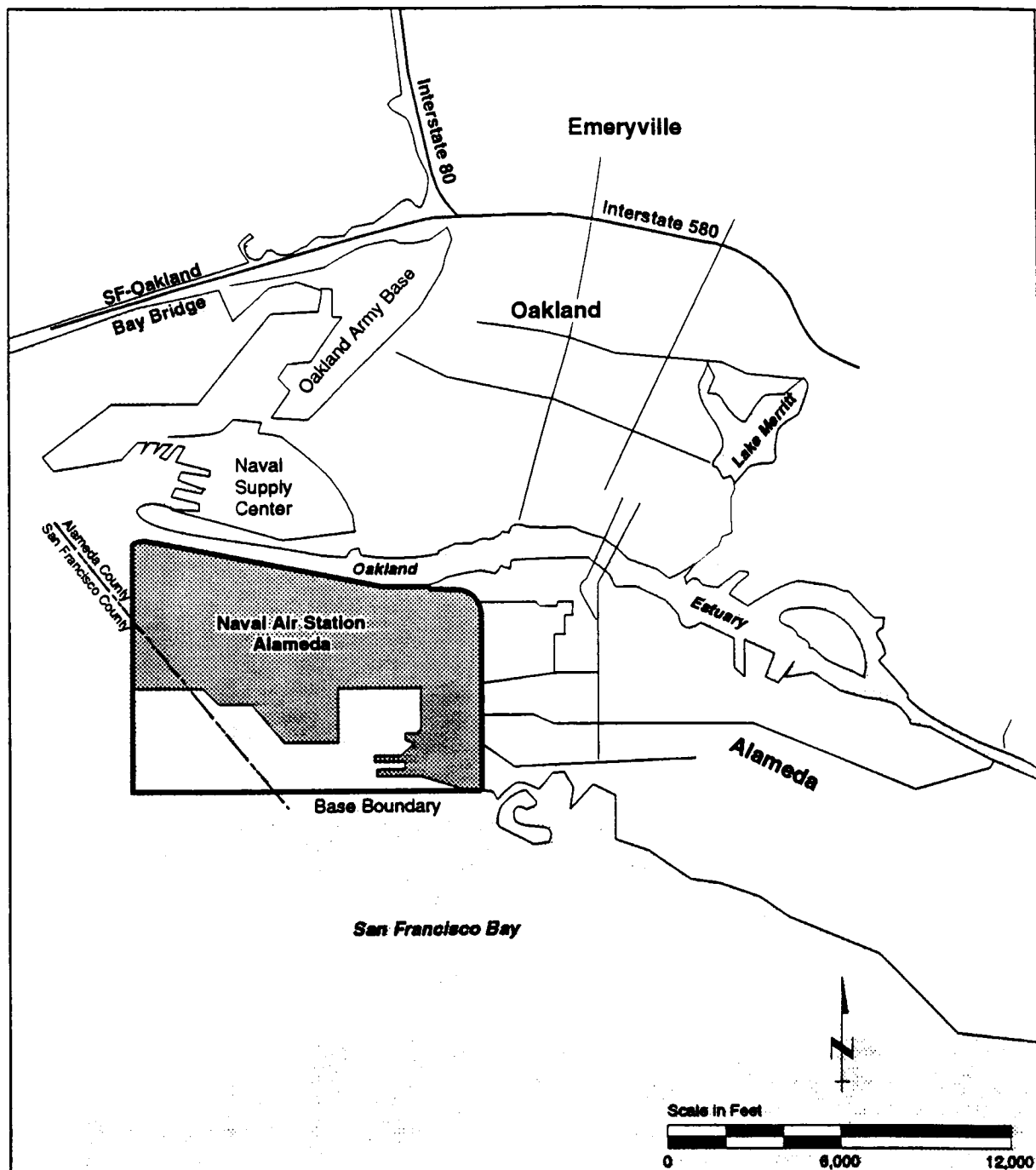
1.5 REPORT ORGANIZATION

This report is organized such that all site-specific information for each site investigated is presented in sections by site. Elements common to all sites are discussed in Sections 1 through 4, and in Sections 15 and Section 16. Section 17 summarizes the results and recommendations for each site.

It should be noted that this is only a data summary report. A subsequent RI report will describe chemical fate and transport, provide a risk assessment, and address potential applicable or relevant and appropriate requirements (ARARs).

The remainder of the report is organized as follows:

- Section 2 - Regional Conceptual Model
- Section 3 - Criteria for Preliminary Data Evaluation
- Section 4 - Phases 1 and 2A Investigation Description and Methods
- Section 5 - Site 1 / 1943-1956 Disposal Area
- Section 6 - Site 2 / West Beach Landfill
- Section 7 - Site 3 / Area 97
- Section 8 - Site 4 / Building 360 (exterior)
- Section 9 - Site 7C / Building 547
- Section 10 - Site 9 / Building 410
- Section 11 - Site 10B / Building 530
- Section 12 - Site 13 / Former Oil Refinery
- Section 13 - Site 16 / CANS C-2 Area
- Section 14 - Site 19 / Yard D-13
- Section 15 - Applicable or Relevant and Appropriate Requirements
- Section 16 - Public Health and Environmental Evaluation
- Section 17 - Conclusions and Recommendations



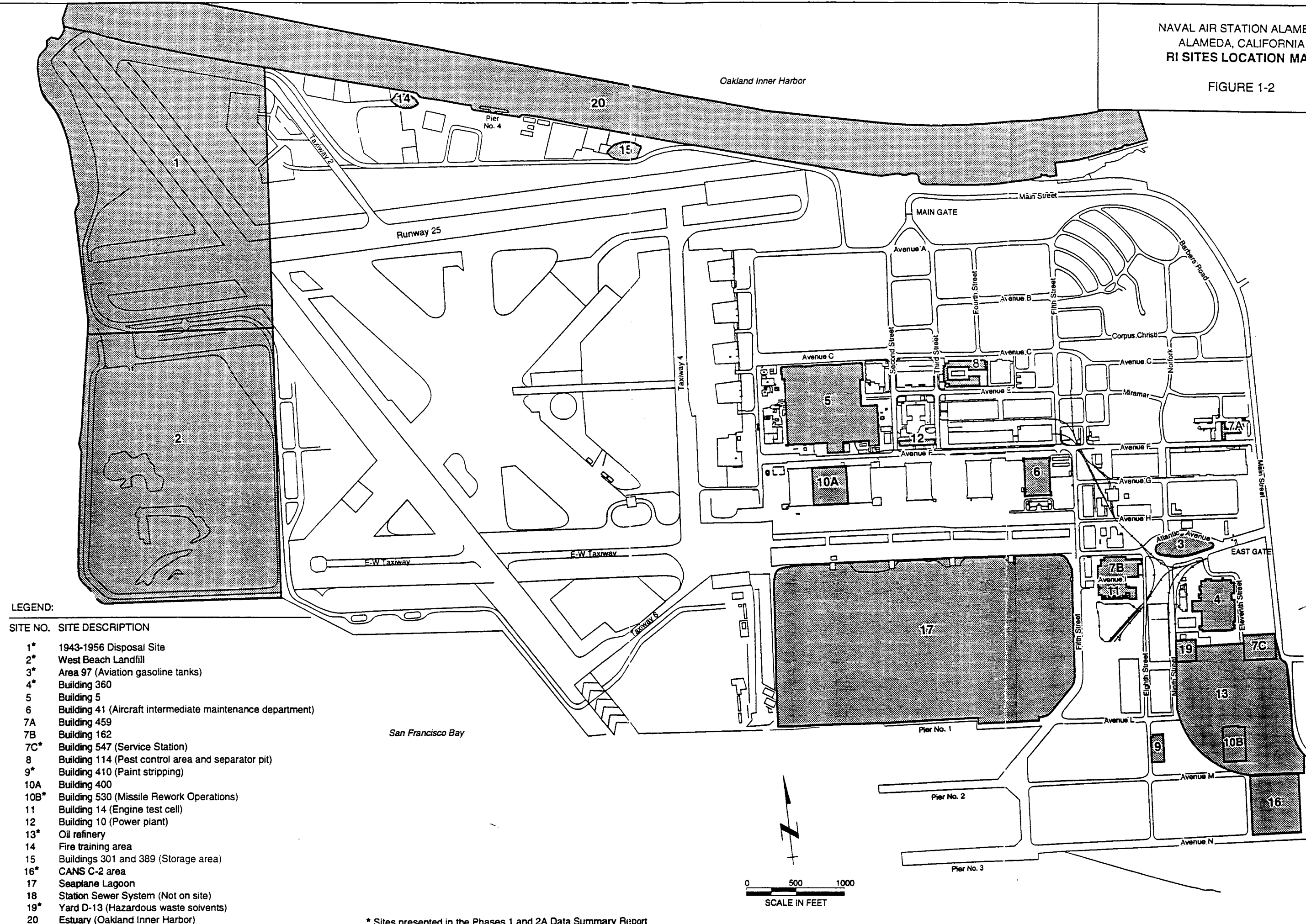
NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA

LOCATION MAP

FIGURE 1-1

FIGURE 1-2

CTO121A

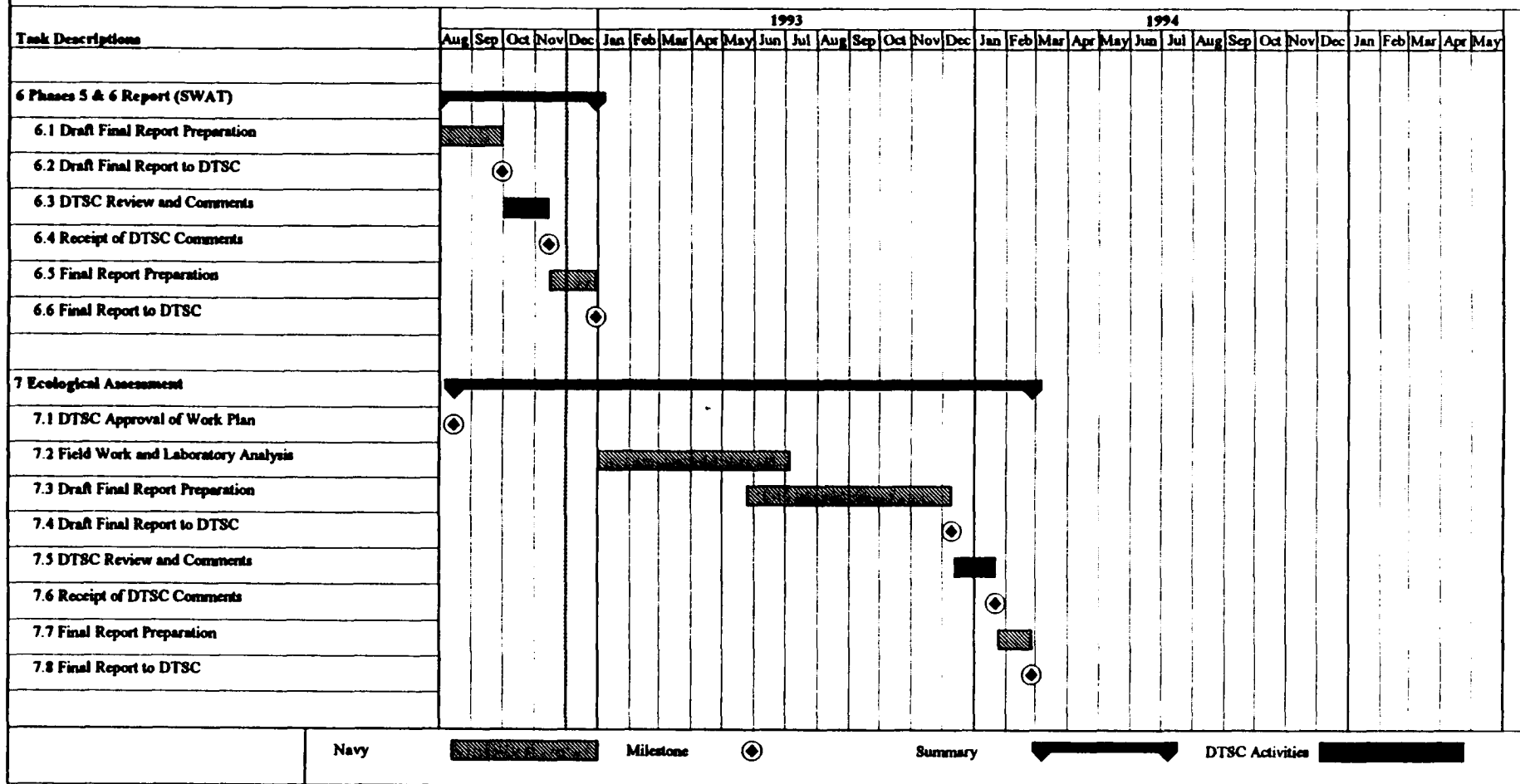


		1993												1994																						
Task Descriptions		Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	
	4 Site 5 Additional Sampling																																			
	4.1 Health & Safety Plan Revisions																																			
	4.2 Field Work and Laboratory Analysis																																			
	4.3 Draft Final Addendum Preparation																																			
	4.4 Draft Final Addendum to DTSC																																			
	4.5 DTSC Review and Comments																																			
	4.6 Receipt of DTSC Comments																																			
	4.7 Final Addendum Preparation																																			
	4.8 Final Addendum to DTSC																																			
	5 Background Sampling - 2nd Round Groundwater																																			
	5.1 Field Work and Laboratory Analysis																																			
	5.2 Draft Final Report Preparation																																			
	5.3 Draft Final Report to DTSC																																			
	5.4 DTSC Review and Comments																																			
	5.5 Receipt of DTSC Comments																																			
	5.6 Final Report Preparation																																			
	5.7 Final Report to DTSC																																			
	Navy											Milestones		Summary											DTSC Activities											

1. Extensive effort is not required to reformat or restructure the Phases 1 and 2A site data base for data summary report preparation.
2. It is assumed that DTSC will take between four to six weeks to review and comment on work plans and draft final reports for the sites at NAS Alameda under CTO Nos. 107 and 121.
3. No additional assessment work is required after the submittal of the final report on the ecological assessment (Phase 4). The Phase 4 work is anticipated to be awarded by the end of November 1992. The actual start date of the Phase 4 work will depend on the award date of the Phase 4 work.
4. Only one additional phase of field work for Phases 1, 2A, 2B, 3, 5, and 6 will be needed for the completion of the RI/FS.
5. Only four quarterly groundwater sampling and analyses are required for the RI/FS. No major aquifer testing is required for the RI/FS.

FIGURE 1-3

Draft Proposed RI/FS Schedule - Phases 1, 2A, 2B, 3, 4, 5, and 6 Sites NAS Alameda



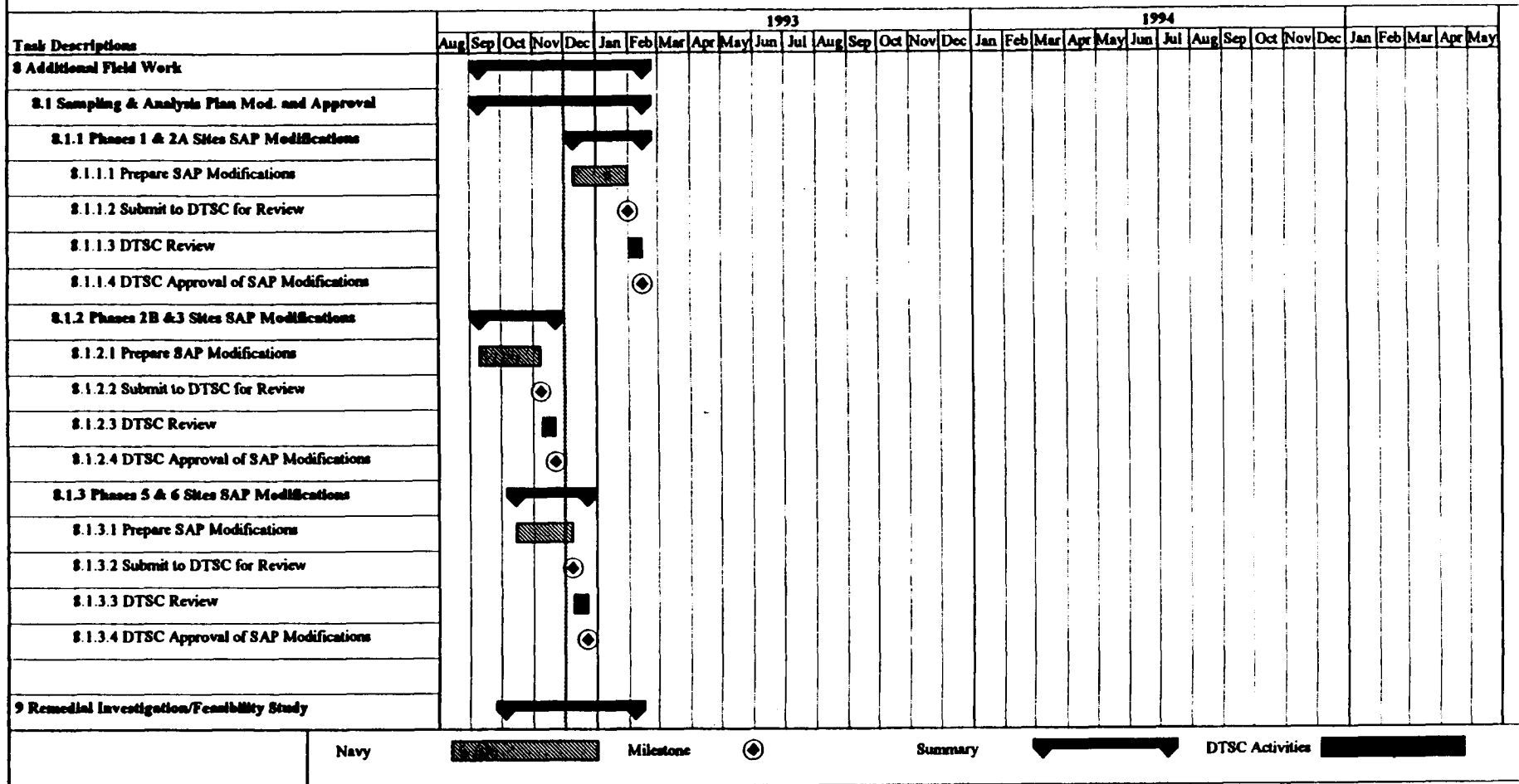
Major Assumptions:

1. Extensive effort is not required to reformat or restructure the Phases 1 and 2A site data base for data summary report preparation.
2. It is assumed that DTSC will take between four to six weeks to review and comment on work plans and draft final reports for the sites at NAS Alameda under CTO Nos. 107 and 121.
3. No additional assessment work is required after the submittal of the final report on the ecological assessment (Phase 4). The Phase 4 work is anticipated to be awarded by the end of November 1992. The actual start date of the Phase 4 work will depend on the award date of the Phase 4 work.
4. Only one additional phase of field work for Phases 1, 2A, 2B, 3, 5, and 6 will be needed for the completion of the RI/FS.
5. Only four quarterly groundwater sampling and analyses are required for the RI/FS. No major aquifer testing is required for the RI/FS.

NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
**DRAFT PROPOSED SCHEDULE FOR
IMPLEMENTATION OF OVERALL RI PROGRAM**

FIGURE 1-3

Draft Proposed RI/FS Schedule - Phases 1, 2A, 2B, 3, 4, 5, and 6 Sites NAS Alameda



Major Assumptions:

1. Extensive effort is not required to reformat or restructure the Phases 1 and 2A site data base for data summary report preparation.
2. It is assumed that DTSC will take between four to six weeks to review and comment on work plans and draft final reports for the sites at NAS Alameda under CTO Nos. 107 and 121.
3. No additional assessment work is required after the submittal of the final report on the ecological assessment (Phase 4). The Phase 4 work is anticipated to be awarded by the end of November 1992. The actual start date of the Phase 4 work will depend on the award date of the Phase 4 work.
4. Only one additional phase of field work for Phases 1, 2A, 2B, 3, 5, and 6 will be needed for the completion of the RI/FS.
5. Only four quarterly groundwater sampling and analyses are required for the RI/FS. No major aquifer testing is required for the RI/FS.

NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
**DRAFT PROPOSED SCHEDULE FOR
IMPLEMENTATION OF OVERALL RI PROGRAM**

FIGURE 1-3

Draft Proposed RI/FS Schedule - Phases 1, 2A, 2B, 3, 4, 5, and 6 Sites NAS Alameda

Task Descriptions	1993												1994																				
	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
9.1 RI/FS Work Plan Preparation/Revision																																	
9.1.1 Prepare RI/FS Work Plan Revision																																	
9.1.2 Draft RI/FS Work Plan to DTSC																																	
</																																	

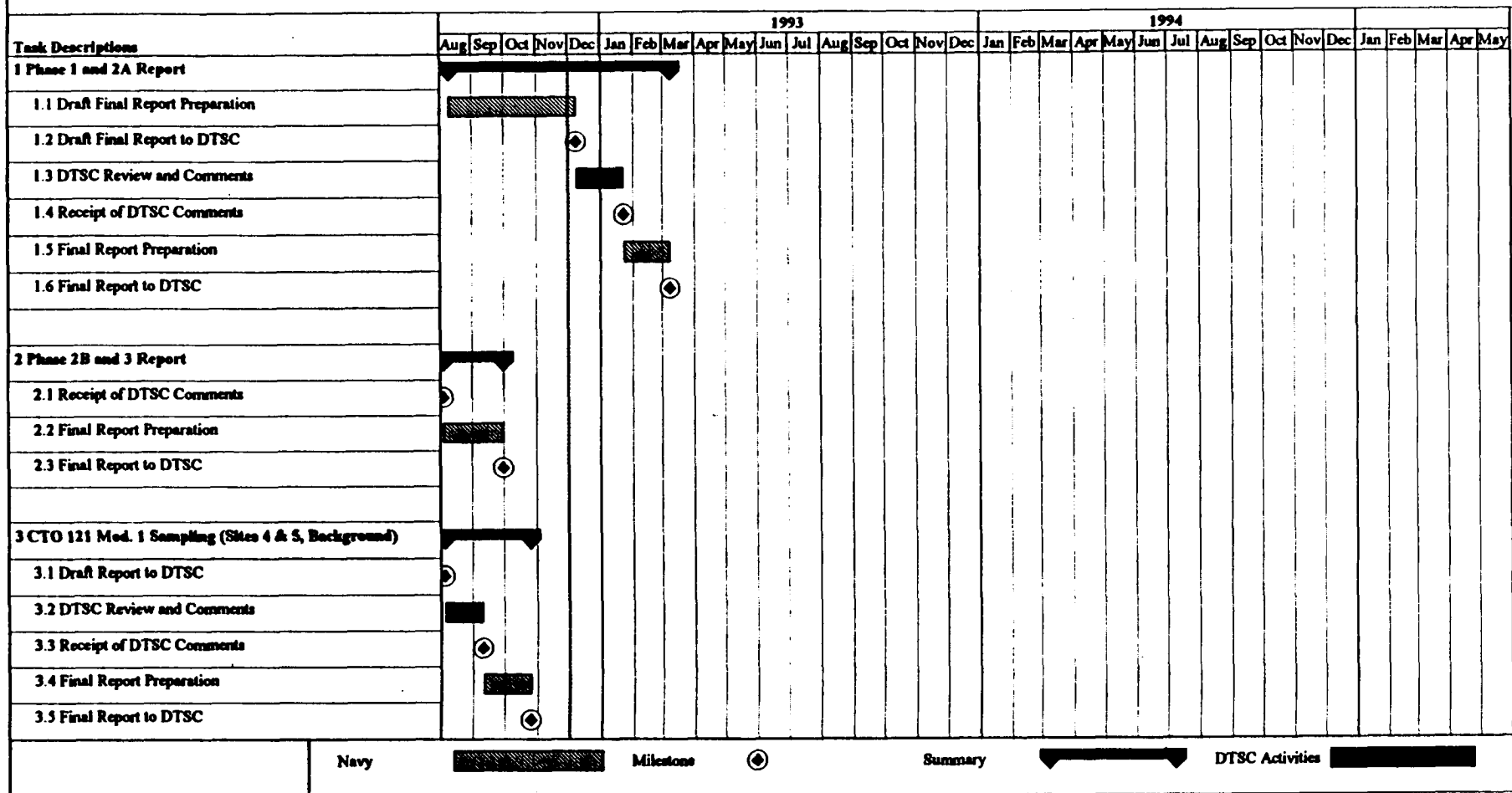
Major Assumptions:

1. Extensive effort is not required to reformat or restructure the Phases 1 and 2A site data base for data summary report preparation.
2. It is assumed that DTSC will take between four to six weeks to review and comment on work plans and draft final reports for the sites at NAS Alameda under CTO Nos. 107 and 121.
3. No additional assessment work is required after the submittal of the final report on the ecological assessment (Phase 4). The Phase 4 work is anticipated to be awarded by the end of November 1992. The actual start date of the Phase 4 work will depend on the award date of the Phase 4 work.
4. Only one additional phase of field work for Phases 1, 2A, 2B, 3, 5, and 6 will be needed for the completion of the RI/FS.
5. Only four quarterly groundwater sampling and analyses are required for the RI/FS. No major aquifer testing is required for the RI/FS.

**NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
DRAFT PROPOSED SCHEDULE FOR
IMPLEMENTATION OF OVERALL RI PROGRAM**

FIGURE 1-3

Draft Proposed RI/FS Schedule - Phases 1, 2A, 2B, 3, 4, 5, and 6 Sites NAS Alameda



Major Assumptions:

1. Extensive effort is not required to reformat or restructure the Phases 1 and 2A site data base for data summary report preparation.
2. It is assumed that DTSC will take between four to six weeks to review and comment on work plans and draft final reports for the sites at NAS Alameda under CTO Nos. 107 and 121.
3. No additional assessment work is required after the submittal of the final report on the ecological assessment (Phase 4). The Phase 4 work is anticipated to be awarded by the end of November 1992. The actual start date of the Phase 4 work will depend on the award date of the Phase 4 work.
4. Only one additional phase of field work for Phases 1, 2A, 2B, 3, 5, and 6 will be needed for the completion of the RI/FS.
5. Only four quarterly groundwater sampling and analyses are required for the RI/FS. No major aquifer testing is required for the RI/FS.

NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
**DRAFT PROPOSED SCHEDULE FOR
IMPLEMENTATION OF OVERALL RI PROGRAM**

FIGURE 1-3

2.0 REGIONAL CONCEPTUAL MODEL

This section presents a conceptual model for NAS Alameda that includes an overview of the geology and hydrogeology of the area and a discussion of the occurrence and quality of groundwater. Site-specific geologic information is presented in the individual site sections, along with the results of the investigation for each site.

2.1 REGIONAL GEOLOGY/HYDROGEOLOGY

Alameda Island is underlain by approximately 400 to 500 feet of unconsolidated sediments unconformably overlying consolidated, Jurassic/Cretaceous (approximately 200 to 65 million years old) Franciscan bedrock (Rogers and Figuers, 1991). The unconsolidated units, from oldest to youngest, are Pliocene to late Pleistocene (from 7 million to 10,000 years old) terrestrial and estuarine deposits, late Pleistocene estuarine deposits, late Pleistocene/Holocene alluvial and eolian deposits, and Holocene (less than 10,000 years old) estuarine deposits (Atwater et al., 1977). These units are roughly equivalent to the Alameda, San Antonio, and Posey formations; the Merritt Sand; and the Young Bay Mud described by previous authors (Trask and Rolston, 1951; Radbruch, 1957) (Figure 2-1). Figure 2-1 presents a stratigraphic column for the area with a comparison to stratigraphic nomenclature previously applied to units in NAS Alameda area. Generalized cross sections illustrating the lateral and vertical relationships of the stratigraphic units are presented on Figure 2-2.

The Alameda, San Antonio, and Posey formations have been previously referred to collectively as the Old Bay Mud (Treasher, 1963). This terminology implies estuarine (bay) deposition for the entire sequence, much of which is in fact terrestrial alluvial (stream) or eolian (wind-blown) deposits. The term Old Bay Mud is therefore not used in this report. The Holocene estuarine units have been previously identified as Young Bay Mud, and the term, Holocene Bay Mud Unit, has been adopted for this report.

The units of primary concern in this investigation are the late Pleistocene/Holocene eolian (Merritt Sand) and alluvial (unnamed) deposits, the Holocene estuarine deposits (Bay Mud) and overlying artificial fill. Descriptions of the entire sequence are presented below, beginning with the oldest (deepest).

Undivided Pliocene/Pleistocene Terrestrial and Estuarine Deposits. Unconsolidated Pliocene/Pleistocene deposits immediately overlie Franciscan bedrock in the vicinity of Alameda Island (Atwater et al., 1977). These deposits are approximately correlative with the Alameda formation of Trask and Rolston (1951) (Figure 2-1). Rogers and Figuers (1991) suggest that the Alameda formation can be divided into two

units: the lower continental unit (300 to 600 feet thick) and an upper marine unit (200 to 400 feet thick). This formation was not encountered during the course of the Phases 1 and 2A investigations and its depth below ground surface (bgs) in the site vicinity is unknown.

Late Pleistocene Estuarine Deposits. Estuarine deposits of late Pleistocene age overlie the undivided Pliocene/Pleistocene deposits. These estuarine deposits include most of the San Antonio formation of Trask and Rolston (1951) (Figure 2-1). The estuarine deposits, in the vicinity of NAS Alameda, consist of a dark greenish-gray silty clay. The unit is present under the westernmost portion of Alameda Island (beneath Sites 1 and 2) at depths between 80 and 120 feet bgs and under the eastern portion of the base (Phase 2A sites) at a depth of between 70 and 90 feet bgs (PRC/Montgomery Watson, 1993c; Radbruch, 1957). Although no wells penetrate the entire formation, it is approximately 40 feet thick (Atwater et al., 1977). The unit is considered to be an aquitard (a unit which retards the downward movement of groundwater) in NAS Alameda area (PRC, 1991).

Late Pleistocene/Holocene Deposits. Alluvial and eolian deposits of late Pleistocene to Holocene age unconformably overlie the late Pleistocene estuarine deposits (Atwater et al., 1977). The alluvial sediments were deposited prior to and contemporaneous with the eolian deposits. The younger portions of the alluvial sediments were deposited east of the Alameda area and are not discussed further in this report. The older portions of alluvial sediments were deposited in a paleochannel that trended roughly east-west through the central portion of NAS Alameda (Radbruch, 1957; PRC, 1991). The paleochannel may have existed at the time eolian deposits were formed or it may have formed later, downcutting through the eolian deposits. The alluvial deposits are typically dark olive gray to gray, silty sand to clayey sand with clay stringers.

The eolian (windblown) deposits are equivalent to the Merritt Sand of Trask and Rolston (1951). These deposits formed as sand dunes when sea level was much lower than today and the western shoreline of the North American continent was outside the Golden Gate passage (Atwater et al., 1977). The Merritt Sand in the vicinity of NAS Alameda consists of orange to orange-brown, fine-grained sand to silty sand. Bivalve shells and shell hash were observed in the unit, indicating some marine reworking during the most recent sea level rise.

In the borings that penetrated between 75 and 120 feet bgs in the western portion of NAS Alameda (Sites 1 and 2), it is difficult to clearly distinguish between the alluvial and eolian deposits. Therefore, in the sections of this report describing these sites, the two units are described as one.

Borings in the southeast corner of NAS Alameda (Phase 2A sites) reached a maximum depth of 17 feet bgs. In these shallow borings, the Merritt Sand was distinguishable by its composition and yellow to orange-

brown color. The Merritt Sand underlies the artificial fill in the majority of Phase 2A borings and is present at depths between 5 and 14 feet bgs. Where it directly underlies the fill, its presence corresponds very well with the shoreline which existed circa 1900 (Figure 2-3).

Holocene Estuarine Deposits. The Holocene estuarine deposits are known as the Bay Mud Unit and are the youngest naturally occurring unit in the vicinity of NAS Alameda. The unit consists of fine-grained deposits, which are equivalent to those being deposited in the present-day San Francisco Bay. In the vicinity of NAS Alameda, the Holocene Bay Mud consists of clay to silty clay with silty and clayey sand interbeds. Bivalve shells are present in some portions of the unit. In the eastern portion of the air station, the uppermost portions of the unit contain abundant plant remains.

At NAS Alameda, the Bay Mud Unit is approximately 12 to 44 feet thick in the western portion (Sites 1 and 2) and thins to 1 to 2 feet in thickness in the eastern portion (Phase 2A sites). According to Canonie's boring logs, it occurs at depths between 22 and 44 feet bgs in the west and at depths between 7 and 12.5 feet bgs in the southeast portion of NAS Alameda. The Bay Mud Unit is present in all borings drilled by Canonie in Sites 1 and 2; it is principally present along the southern and southwestern fringes of the Phase 2A sites as a 1- to 2-foot-thick layer separating the Merritt Sand from the overlying artificial fill.

Artificial Fill. Artificial fill ranging in thickness from 5 to 44 feet was encountered in all of the borings drilled for the Phases 1 and 2A investigations. The artificial fill varies in thickness from 5 to greater than 15 feet in the southeast portion of NAS Alameda beneath the Phase 2A sites. The fill thickens to the southwest and south (offshore). The fill is thinnest at the southeast corner of the former oil refinery (Site 13). Most of the fill consists of dredge spoils from the surrounding San Francisco Bay, the Seaplane Lagoon, and the Oakland Channel. The composition of the fill varies, but it is generally silty sand to sand with minor inclusions of clay and/or gravels. The sand fill is similar to the late Pleistocene/Holocene eolian deposits, which in most cases served as a source for the fill where it underlies the surrounding bay.

Historical aerial photographs indicate that by 1939 portions of the present-day air station located both northeast and northwest of the Seaplane Lagoon were still submerged. The central portion of the air station (north of the Seaplane Lagoon) had been filled by what appears to be hydraulic fill operations. In a February 1939 photo (Pacific Aerial Surveys, 1939), the northern half of the air field appears to be filled. In these photos fill appeared to be placed in east-west linear rows, with the intervening swales filled with water. This fill procedure may have produced a systematic variation in grain size of the fill material, with finer grained material being deposited closer to the water-filled swales and coarser grained material being deposited closer to the point at which the hydraulic fill pipe discharged. This potential variation in grain size, if present, could

affect shallow groundwater flow by creating preferential groundwater flow paths within the coarser grained material.

2.2 GROUNDWATER OCCURRENCE

When it was reported, groundwater was encountered at depths between 5 and 10 feet in the six borings drilled by Canonie at Sites 1 and 2. Groundwater monitoring wells were not installed in these borings, so the local groundwater gradient was not determined by Canonie. However, the Phases 5 and 6 draft final SWAT report for the same sites was submitted to the DTSC in September of 1992 (PRC/Montgomery Watson 1993c), and incorporates the geologic and hydrogeologic data generated during Canonie's investigation, and the additional Phase 5 and 6 field investigation performed by the PRC team. A detailed discussion of the groundwater setting beneath these sites is presented in the SWAT report.

Water level measurements taken at the Phase 2A sites in November 1990 indicate that groundwater beneath the Phase 2A sites occurs between approximately 5.0 and 7.5 feet bgs (Figure 2-4). Groundwater gradients generally ranged between 0.002 and 0.004 foot/foot across the sites. The overall groundwater flow direction was to the west and southwest; however, a groundwater high was located beneath Site 4. Groundwater appears to flow radially from this site outward, north to the Oakland Estuary and west and southwest to the bay.

2.3 GROUNDWATER QUALITY

Total dissolved solids (TDS) is a water quality parameter that is often employed to assess the suitability of groundwater for various uses. Groundwater can be classified as fresh, brackish, or saline based on TDS and/or specific conductivity values (Table 2-1). TDS measurements from 27 of 31 groundwater wells sampled by Canonie on November 8, 1990 are presented in Table 2-2 and shown on Figure 2-5. Currently, the California State Water Resources Control Board (SWRCB) classifies water with a TDS of less than 3,000 milligrams per liter (mg/L) as "potentially suitable for municipal or domestic water supply" (SWRCB, 1988a). The values ranged from a low of 320 mg/L to a high of 22,300 mg/L; 23 wells reported TDS values below 3,000 mg/L.

TABLE 2-1
CLASSIFICATION OF WATER BY TDS AND SPECIFIC CONDUCTANCE

Classification	Total Dissolved Solids (a) (mg/L)	Specific Conductance (b) (μ mhos/cm)
Fresh Water	0-3,000	0 - [3,900-5,400]
Brackish Water	3,000-10,000	[3,900-5,400] - [13,000-18,000]
Saline Water	10,000-100,000	[13,000-18,000] - [130,000-180,000]
Brine	More than 100,000	More than [130,000-180,000]

Notes: a - Total Dissolved Solids from the California SWRCB (1988a) and Freeze and Cherry (1979)
 mg/L = Milligrams per liter
 b - [] = Conductance varies by anion and temperature so conversion from TDS is inexact.
 Range is specific conductance multiplied by (.55 to .75) = TDS.
 μ mhos/cm = Micromhos per centimeter
 Conversion of Specific Conductance to TDS from Driscoll, 1987.

TABLE 2-2

WATER QUALITY DATA FOR SHALLOW GROUNDWATER MONITORING WELLS
(Sheet 1 of 2)

Site Number		Specific	pH	Total	TDS	Hardness	Total Organic	Anions			
Well	Date	Conductance		Alkalinity			Carbon	Chloride	Fluoride	Nitrate	Sulfate
Number	Sampled	(micromhos/cm)		(mg/L-CaCO3)	(mg/L)	(mg/L-CaCO3)	(mg/L)	(mg/L)	(mg/L)	(mg/L as N)	(mg/L)
Site 3											
MW97-1	8/30/90	11,300	7.4	1550	6440	920	53.8	NA	NA	NA	NA
MW97-2	8/31/90	36,000	6.8	2430	22300	4050	79.5	NA	NA	NA	NA
MW97-3	10/18/90	2,000	7.1	410	1280	614	11	NA	NA	NA	NA
Site 4											
MW360-1	7/11/90	3,950	7.3	1000	3180	398	27.3	546	NA	NA	175
MW360-2	7/11/90	1,210	7.3	390	980	466	24.5	125	NA	NA	47
MW360-3	7/10/90	1,590	7.4	732	1510	483	38.8	54	NA	NA	72
MW360-4	8/3/90	1,140	7.6	340	1110	627	14.1	125	NA	NA	83
Site 7											
MW547-1	8/7/90	930	7.4	NA	NA	310	18.9	NA	NA	NA	NA
MW547-2	8/8/90	810	7.4	NA	NA	509	37.8	NA	NA	NA	NA
MW547-3	8/7/90	980	7.5	NA	NA	250	15.6	NA	NA	NA	NA
MW547-4	8/6/90	NA	NA	NA	NA	NA	23.8	NA	NA	NA	NA
MW547-5	8/6/90	1,130	7.2	NA	NA	568	21.7	NA	NA	NA	NA
MW547-5A	8/6/90	1,260	7.7	NA	NA	310	NA	NA	NA	NA	NA
Site 9											
MW410-1	8/21/90	1,560	7.8	220	990	244	4.7	382	NA	NA	15
MW410-2	8/22/90	1,020	7.7	470	660	290	12	28	NA	NA	43
MW410-3	8/21/90	1,070	7.4	450	846	475	7.2	42	NA	NA	140
MW410-4	8/22/90	380	8.4	160	320	250	7.8	13	NA	NA	18

TABLE 2-2

WATER QUALITY DATA FOR SHALLOW GROUNDWATER MONITORING WELLS
(Sheet 2 of 2)

Site Number	Well Number	Date Sampled	Specific Conductance (micromhos/cm)	pH	Total Alkalinity (mg/L-CaCO3)	TDS (mg/L)	Hardness (mg/L-CaCO3)	Total Organic Carbon (mg/L)	Anions			
									Chloride (mg/L)	Fluoride (mg/L)	Nitrate (mg/L as N)	Sulfate (mg/L)
Site 10												
	MW530-1	8/23/90	1,050	8.3	410	970	NA	22.9	73	NA	NA	16
	MW530-2	8/23/90	1,880	6.7	680	1370	NA	95	71	NA	NA	195
	MW530-3	8/24/90	900	7.6	NA	610	498	28.3	63	NA	NA	25
Site 13												
	MW-1	10/15/90	2,580	7	NA	1820	NA	67.6	NA	NA	NA	NA
	MWOR-1	8/24/90	4,020	6.8	NA	3160	NA	21.3	NA	NA	NA	NA
	MWOR-2	8/27/90	2,320	7.8	NA	1380	NA	23.2	NA	NA	NA	NA
	MWOR-3	8/27/90	1,410	7.4	NA	880	NA	15.1	NA	NA	NA	NA
	MWOR-4	8/27/90	470	6.7	NA	620	NA	7.5	NA	NA	NA	NA
	MWOR-5	8/28/90	540	7.2	NA	780	NA	10	NA	NA	NA	NA
Site 16												
	MWC2-1	8/29/90	810	8.4	240	780	211	10.3	47	NA	NA	39
	MWC2-2	10/18/90	700	7.8	240	460	321	9.7	28	NA	NA	54
	MWC2-3	8/30/90	290	8.4	110	350	260	10.7	9.1	NA	NA	20
Site 19												
	MWD13-1	10/18/90	1,590	7.3	<5.00	113	1360	27	870	NA	NA	52
	MWD13-2	8/9/90	570	7.7	<5.00	14	440	7.1	280	NA	NA	33
	MWD13-3	10/18/90	620	9.7	<5.00	129	480	NA	220	NA	NA	68
	MWD13-4	10/17/90	1,410	12	98	101	770	NA	450	NA	NA	129

TDS = Total Dissolved Solids

NA = Not Analyzed

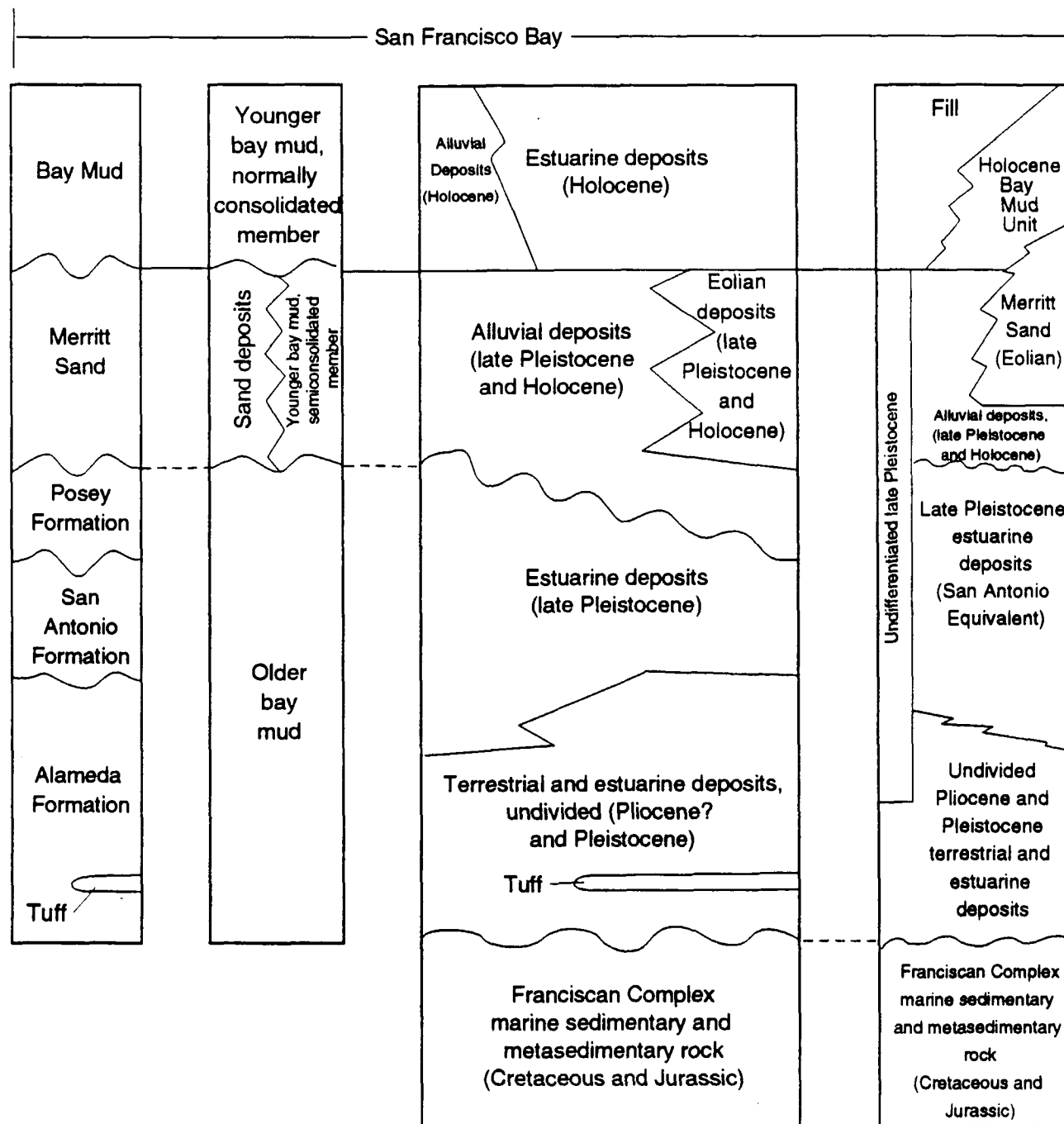
pH and Specific Conductance are field measurements. Reported precision is subject to varying measurement techniques.

Trask and
Rolston (1951)

Treasher
(1963, p.24)

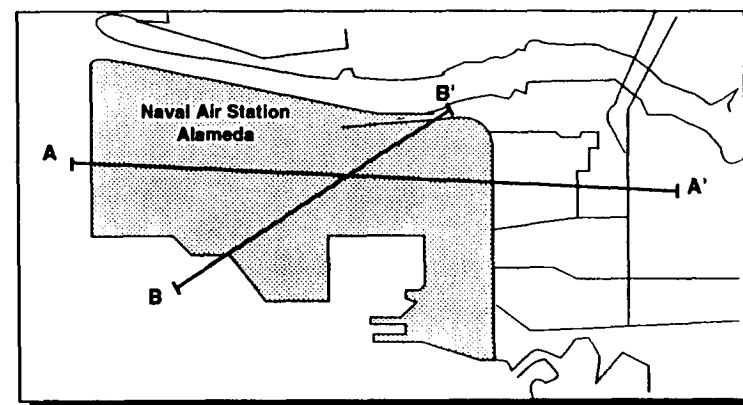
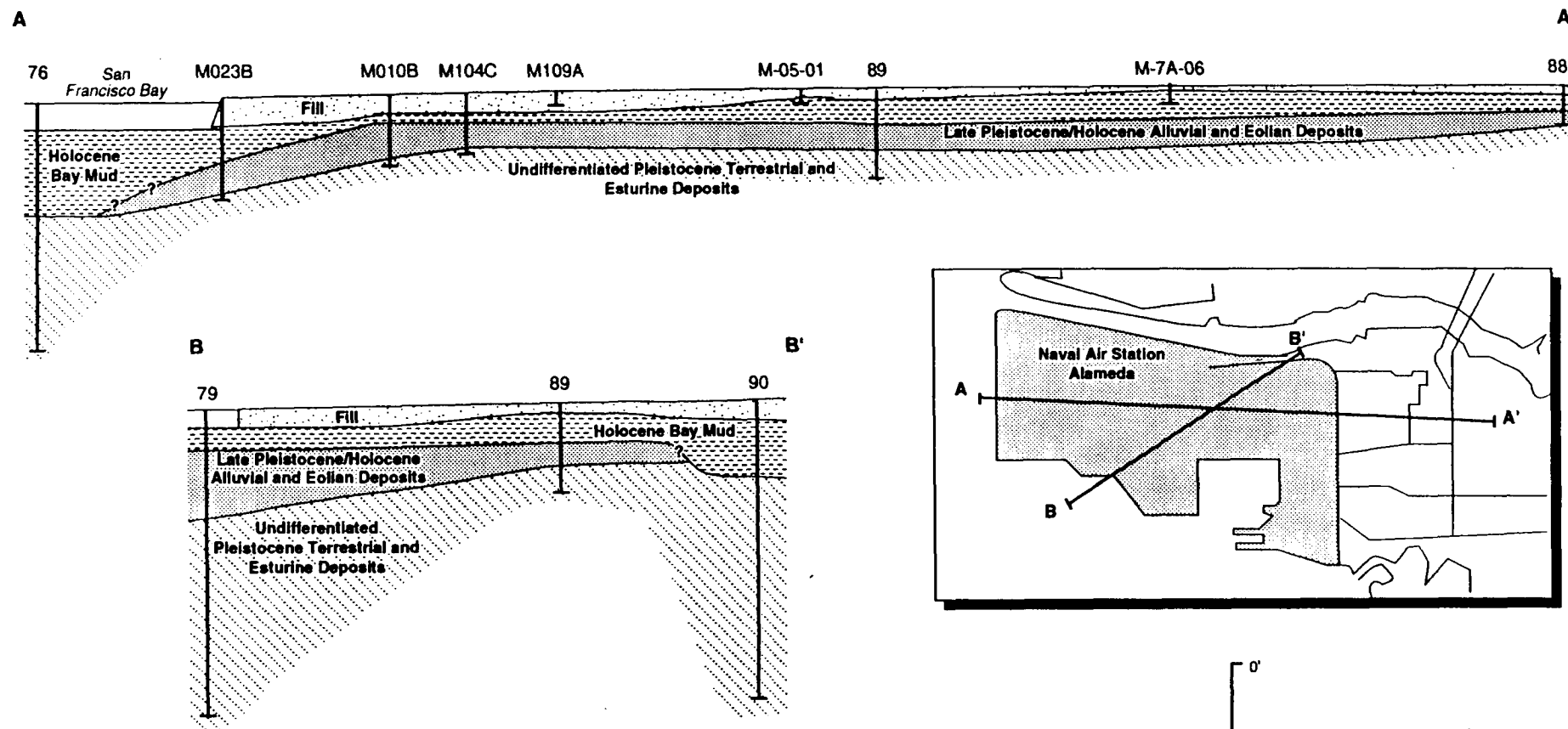
Atwater et al.,
1977

This Report








NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
**IDEALIZED STRATIGRAPHIC COLUMN
FOR ALAMEDA AREA**

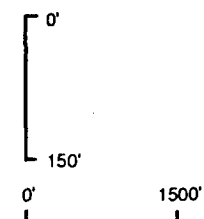
FIGURE 2-1



LEGEND:

-  Fill
-  Holocene Bay Mud
-  Late Pleistocene/Holocene Alluvial and Eolian Deposits
-  Undifferentiated Pleistocene Terrestrial and Estuarine Deposits
-  Water

- Borings beginning with "M" are JMM monitoring wells
 - Other borings are from "Areal and Engineering Geology of the Oakland West Quadrangle, California", Dorothy R. Radbruch, 1957.



SCALE IN FEET
 VERTICAL EXAGGERATION 10:1

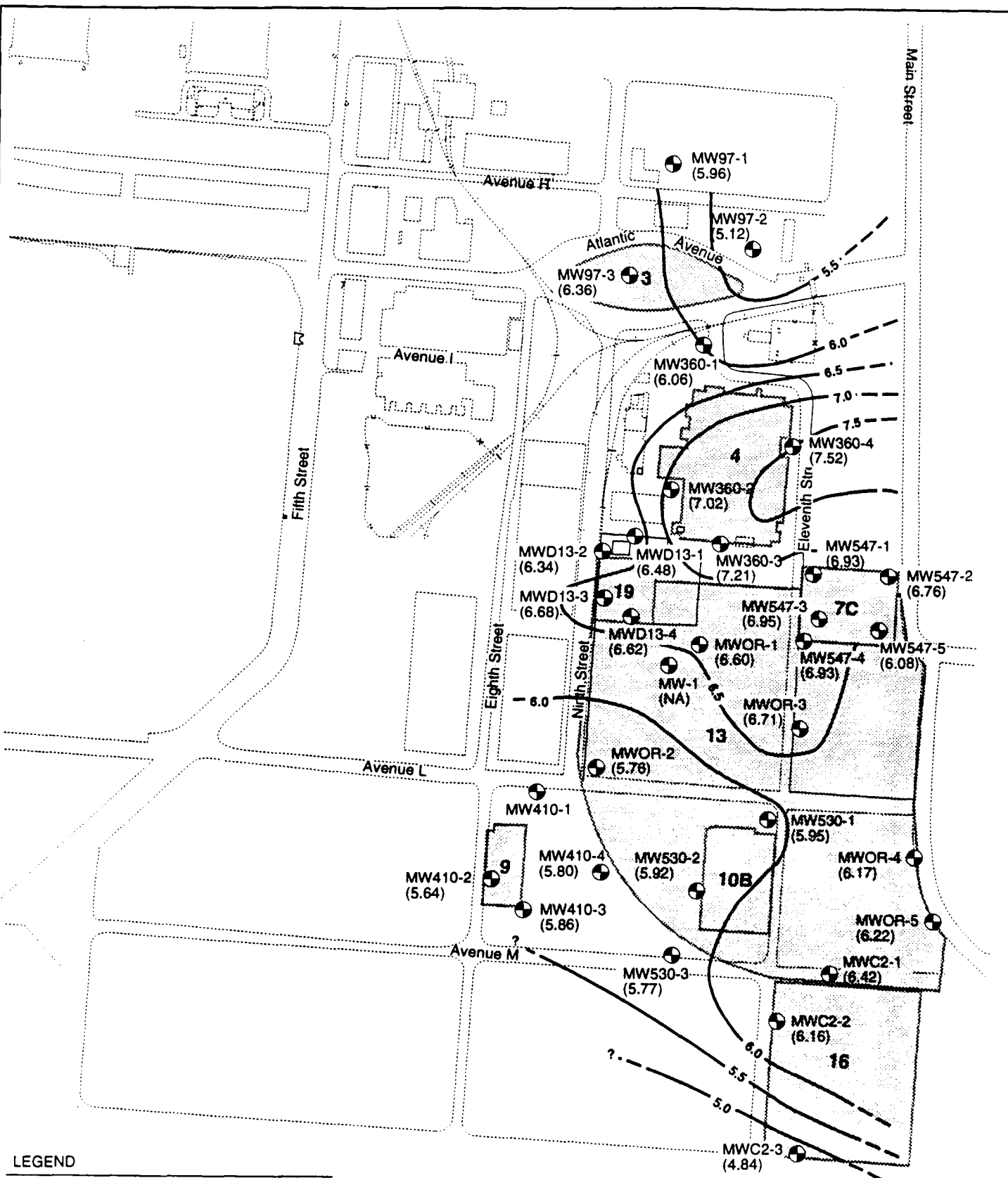
NAVAL AIR STATION ALAMEDA ALAMEDA, CALIFORNIA BASEWIDE GEOLOGIC CROSS SECTIONS

FIGURE 2-2

NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
SHORELINE CIRCA 1900

FIGURE 2-3



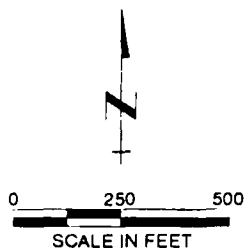


LEGEND

- Canolie Monitoring Well Location
- (5.96)

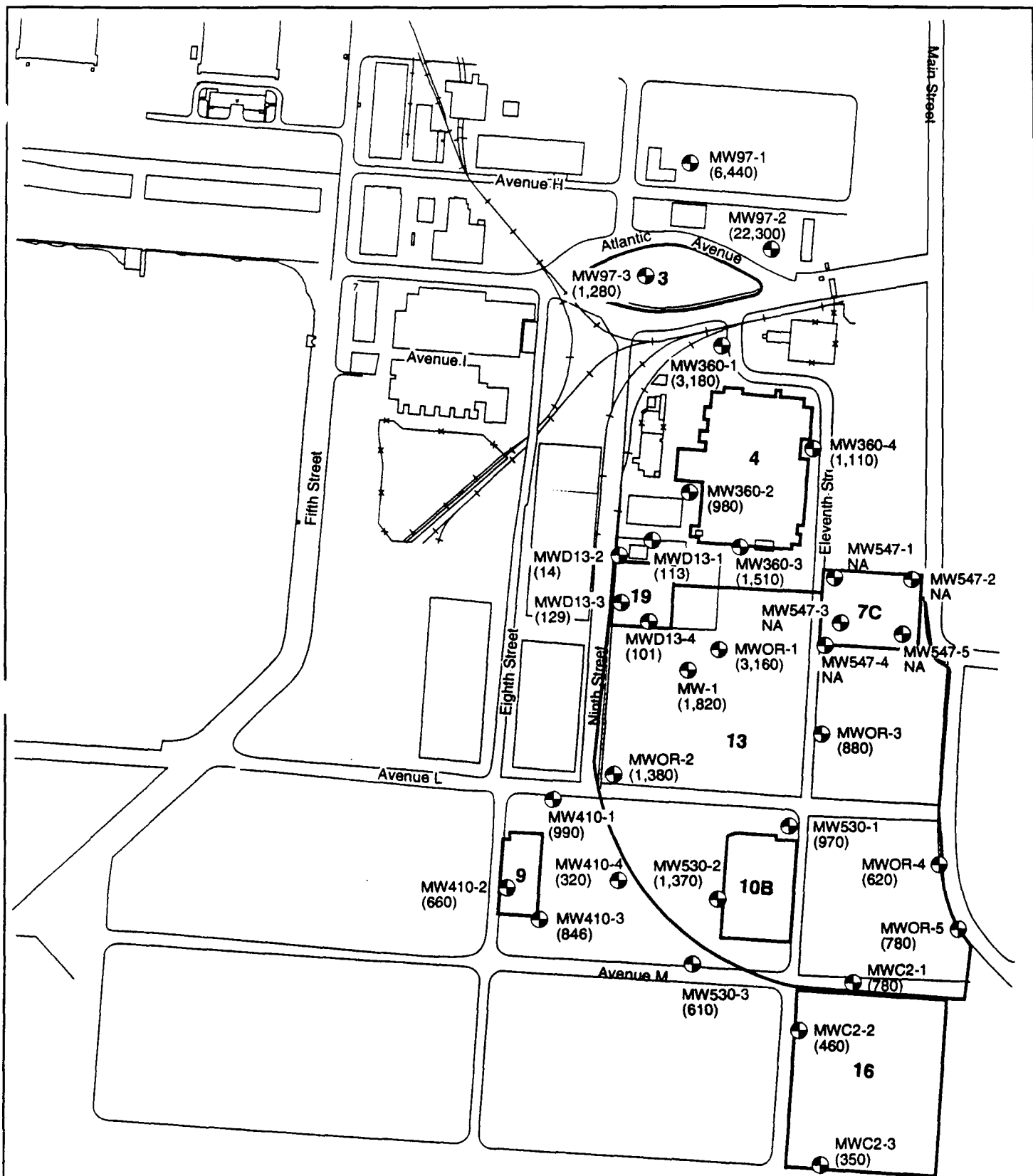
Groundwater Elevation
(feet above mean low low sea level)
- Groundwater Elevation Contour (feet)

NOTE: Boring and monitoring well locations were obtained from a base map provided by Canolie Environmental, Inc. The individual locations were digitized onto a base map CAD file provided by NAS Alameda.



NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
**GROUNDWATER CONTOUR MAP
OF PHASE 2A SITES
NOVEMBER 8, 1990**

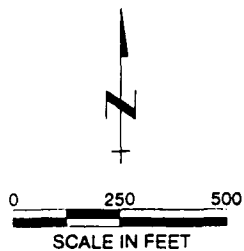
FIGURE 2-4



LEGEND:

⊕ Canonie Monitoring Well Location
(1,820) TDS Value (mg/l)

NOTE: Boring and monitoring well locations were obtained from a base map provided by Canonie Environmental, Inc. The individual locations were digitized onto a base map CAD file provided by NAS Alameda.



NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
TOTAL DISSOLVED SOLIDS (mg/l)

FIGURE 2-5

3.0 CRITERIA FOR PRELIMINARY DATA EVALUATION

This section provides a discussion of several issues related to the evaluation of analytical data generated for the Phases 1 and 2A investigations performed by Canonie. It should be recognized that this is a data summary report, and that interpretations will be presented in the Phases 7 and 8 comprehensive RI report to be prepared for NAS Alameda.

3.1 ANALYTICAL DATA QUALITY CONSIDERATIONS

When reviewing the analytical data presented herein, it is important to consider the limitations of these data. Limitations of any data are identified through review of the quality control (QC) data provided by the laboratory. Such QC data are analytical results of the field QC samples (such as field duplicates, trip blanks, and equipment rinsate samples from equipment decontamination activities), analytical results of laboratory QC samples (such as method blanks, standards of known concentrations (surrogates), matrix spikes, and matrix spike duplicates), and other laboratory QC parameters (such as calibration curves, surrogate percent recoveries, matrix and matrix spike duplicate recoveries, and relative percent differences). In general, the QC assessment uses the data quality objectives (DQO) expressed as precision, accuracy, representativeness, completeness, and comparability (PARCC) that are based on EPA procedures.

During the preparation of this report, the PRC team determined that the following QC information was not included in the data packages provided by Canonie.

- Initial and continuing calibration curves for chemical analyses were not included in the data packages.
- Batch QC samples such as method blanks and laboratory control samples are not always found within the data packages.

The PRC team has attempted to obtain the QC information from Canonie. At present, this QC information has not been obtained for data validation, and it may not be recoverable. As a result, data presented in this report are used only for qualitative assessment of the chemicals present in surface soil, subsurface soil, and groundwater at these ten Phases 1 and 2A sites, and for identification of the need for additional activities, such as drilling and sampling, at this stage of the investigation. At present, the Navy is still evaluating options to retrieve as much as possible of the required QC information to complete the data validation process.

3.2 EVALUATION OF DATA FOR SOILS

This section presents a set of preliminary comparison levels developed for the qualitative assessment of the Phases 1 and 2A soil data collected by Canonie. These levels are intended for comparing the Phases 1 and 2A data to identify whether the soils at each site pose a significant concern to the environment. These levels were not generated for setting the remediation goals for NAS Alameda. The significance of the chemicals found in soils at these ten sites will be evaluated in detail during the baseline risk assessment to be performed during the comprehensive RI/FS work (Phases 7 and 8). The need for remediation and the remediation goals will be developed based on the potential exposure pathway and the results of the baseline risk assessment for NAS Alameda. The baseline risk assessment will consider all data and take into account both environmental and human receptors. Details of the preliminary comparison levels and rationale are presented below.

- **Volatile Organic Chemicals (VOCs) and Semivolatile Organic Chemicals (SVOCs).** The preliminary levels for VOCs and SVOCs have been set as total VOCs of 1 milligram per kilogram (mg/kg) and total SVOCs of 10 mg/kg, respectively. These levels have been applied by the Regional Water Quality Control Board (RWQCB) as the remediation goals in vadose zone soil for sites in the Bay Area where groundwater is considered as potable drinking water supply. If results of the future groundwater sampling conclude that groundwater at NAS Alameda is not considered as potable drinking water, the remediation goals for VOCs and SVOCs could likely be higher than these levels. Therefore, these levels are believed to be conservative and appropriate to be used for this qualitative assessment of the Phases 1 and 2A data.
- **Total Recoverable Petroleum Hydrocarbons (TRPH), Oil and Grease, and Total Petroleum Hydrocarbons (TPH) as Diesel.** The preliminary comparison level for TRPH is set as 100 mg/kg. In general, petroleum hydrocarbons used at NAS Alameda are fuel products and are released to the soil through tank leaks or spills. The California SWRCB Leaking Underground Fuel Tank (LUFT) Field Manual, October 18, 1989 (SWRCB, 1989) provides a procedure to estimate the maximum allowable TPH in soils. In general, the maximum allowable levels are 10 mg/kg to 1,000 mg/kg for gasoline, and 100 mg/kg to 10,000 mg/kg for diesel in soils. According to the Navy, the fuel products stored at NAS Alameda are aviation fuel products, which are heavier than gasoline. Therefore, the preliminary comparison level of 100 mg/kg for TRPH based on TPH as diesel is selected for this qualitative assessment. No regulatory standards have been identified for oil and grease; therefore, for the purpose of this qualitative assessment, the 100 mg/kg level will be used for oil and grease as well. These comparison levels are not considered as the final remediation goal; the final level will be established during the RI/FS process.
- **Pesticides and Polychlorinated Biphenyls (PCBs).** The preliminary comparison levels of individual pesticides and PCBs are both 1 mg/kg. These levels are generally considered by the EPA as levels that may trigger additional investigation at any site (U.S. EPA, 1990b).
- **Metals.** Because metals are naturally occurring in the environment, it is important to establish site-specific background metals concentrations in soils in order to evaluate whether surface and subsurface soils have been impacted by metals that are a result of past industrial activities. Background sample collection and an evaluation of background levels of metals in soils were conducted during the Phases 2B, 3, 5, and 6 investigations (PRC/JMM, 1992c,d). Samples

were collected at locations where there was no known history of chemical uses or operations. Two sets of background samples were collected, one for Sites 1 and 2, are located on the west side of the base, and one for the remaining Phases 1 and 2A sites, on the east side of the base. A statistical analysis was performed to estimate the background metals concentrations at the 95 percent/95 percent statistical tolerance interval for these two areas.

Results of the metals analyses by Canonie for each site were compared with two reference levels. The primary reference levels are the 95 percent/95 percent statistical tolerance interval of metals concentrations in the background samples collected at NAS Alameda. The secondary reference levels are concentrations found in typical soils in the United States (U.S.) as presented by Dragun (1988). The background metal statistical tolerance intervals for NAS Alameda are presented in Table 3-1, and concentrations of metals in typical soils in the U.S. are listed in Table 3-2.

The 95 percent/95 percent statistical tolerance interval is the range within which 95 percent of the samples collected in an area are expected to fall 95 percent of the time. Samples with concentrations outside of this range may be below or above background concentrations. The lower and upper limits of the 95 percent/95 percent statistical tolerance interval were calculated by subtracting and adding the standard deviation of metals concentrations in the background samples collected at NAS Alameda multiplied by a statistical tolerance factor (K) to the mean. K is a variable dependent on the proportion of the population being included in the tolerance interval (95 percent), the probability of inclusion in the interval (95 percent), and the number of samples on which the standard deviation is based (Taylor, 1990). A thorough discussion of the evaluation of background concentrations in soil is presented in the background data summary report (PRC/JMM, 1992c) and the Phases 5 and 6 SWAT report (PRC/Montgomery Watson, 1993c).

3.3 EVALUATION OF DATA FOR GROUNDWATER

This section presents a set of preliminary comparison levels developed for the qualitative assessment of the Phases 1 and 2A groundwater data collected by Canonie. These levels are intended for comparing the results of the Phases 1 and 2A data to identify whether the groundwater at each site poses an impact to the environment. The levels are not intended for setting the remediation goals for NAS Alameda. The significance of the chemicals found in groundwater at these ten sites will be evaluated in detail during the baseline risk assessment to be performed during the comprehensive RI/FS work (Phases 7 and 8). The need for remediation and the remediation goals will be based on the potential exposure pathway and the results of the baseline risk assessment for NAS Alameda. Details of the preliminary comparison levels and rationale are presented below.

- **VOCs, SVOCs, TRPH, and Pesticides and PCBs.** Unlike metals that are naturally occurring in the environment, most of the organic compounds detected in groundwater at the sites are reasonably associated with past industrial activities. Detections of these organic compounds may indicate that impact to the groundwater quality has occurred. However, because only one round of groundwater sampling was performed during the Phases 1 and 2A investigations, the significance of the data could not be addressed at this time.

- **Metals.** Because metals occur naturally in the environment, it is important to establish site-specific background concentrations for metals in groundwater to evaluate whether groundwater has been impacted by metals as a result of past industrial activities. Background sample collection and an evaluation of background levels of metals in groundwater were conducted during the Phases 2B, 3, 5, and 6 investigations (PRC/JMM, 1992a,d). A statistical analysis was performed to estimate the background concentrations of metals at the 95 percent/95 percent statistical tolerance interval, as discussed in Section 3.2 for soils.

Results of the metals analyses by Canonie for each site were compared with two reference levels. The primary reference levels are the 95 percent/95 percent statistical tolerance interval of metal concentrations in the background samples collected at NAS Alameda, whereas the secondary reference levels are concentrations found in typical groundwater in the U.S. presented by Dragun (1988). The background metals statistical tolerance intervals for the groundwater in NAS Alameda are presented in Table 3-3, and concentrations of metals in typical groundwater in the U.S. are listed in Table 3-4.

TABLE 3-1

NAS ALAMEDA - BACKGROUND BORINGS
STATISTICAL ANALYSIS OF METALS RESULTS FOR SOIL SAMPLES
 (Sheet 1 of 2)

	Average Concentration	Standard Deviation	Statistical Tolerance Factor	95%/95% Statistical Tolerance Interval ^a	
				Lower Limit (mg/kg) ^b	Upper Limit (mg/kg)
For Sites 1 and 2					
Aluminum	4340	1790	2.83	0	9460
Antimony	1.2	0.4	2.83	0.2	2.3
Arsenic	3.99	3.93	2.83	0	15.1
Barium	38.0	22.6	2.83	0	102
Beryllium	0.41	0.39	2.83	0	1.51
Cadmium	0.37	0.57	2.83	0	1.97
Chromium	30.4	12.4	2.83	0	65.4
Cobalt	7.31	10.7	2.83	0	37.5
Copper	8.17	4.09	2.83	0	19.7
Lead	8.49	8.24	2.83	0	31.8
Mercury	0.04	0.02	2.83	0	0.09
Nickel	28.3	13.1	2.83	0	65.5
Selenium	0.30	0.34	2.83	0	1.26
Silver	0.45	0.28	2.83	0	1.24
Thallium	0.11	0.04	2.83	0	0.21
Vanadium	17.7	4.65	2.83	4.53	30.8
Zinc	21.1	7.28	2.83	0.53	41.8

TABLE 3-1
NAS ALAMEDA - BACKGROUND BORINGS
STATISTICAL ANALYSIS OF METALS RESULTS FOR SOIL SAMPLES
(Sheet 2 of 2)

	Average Concentration	Standard Deviation	Statistical Tolerance Factor	95%/95% Statistical Tolerance Interval	
				Lower Limit (mg/kg)	Upper Limit (mg/kg)
For Sites Excluding Sites 1 and 2					
Aluminum	7590	3950	2.87	0	18900
Antimony	4.34	0.43	2.87	3.10	5.58
Arsenic	2.15	0.92	2.87	0	4.80
Barium	50.9	20.8	2.87	0	111
Beryllium	0.38	0.17	2.87	0	0.87
Cadmium	0.48	0.10	2.87	0.19	0.76
Calcium	3280	1210	2.87	0	6740
Chromium	34.5	10.4	2.87	4.59	64.3
Cobalt	4.66	2.16	2.87	0	10.9
Copper	10.8	7.74	2.87	0	33.0
Iron	12500	5420	2.87	0	28000
Lead	15.8	15.8	2.87	0	61.1
Magnesium	3290	1860	2.87	0	8610
Manganese	160	79.8	2.87	0	390
Mercury	0.08	0.15	2.87	0	0.50
Nickel	28.1	10.3	2.87	0	57.6
Potassium	1070	459	2.87	0	2390
Selenium	0.29	0.27	2.87	0	1.07
Silver	0.56	0.06	2.87	0.39	0.73
Sodium	475	264	2.87	0	1230
Thallium	0.19	0.02	2.87	0.13	0.25
Vanadium	28.4	10.9	2.87	0	59.7
Zinc	53.2	71.0	2.87	0	257

Source: PRC/JMM, 1992c; PRC/JMM, 1992d

^a Tolerance Interval = Average \pm (Standard Deviation x Statistical Tolerance Factor) (Taylor, 1990)

^b Negative concentrations are rounded to zero.

TABLE 3-2

NATIVE SOIL CONCENTRATIONS OF VARIOUS ELEMENTS

Elements	Typical Range (mg/kg)	Extreme Range (mg/kg)
Aluminum	10,000 - 300,000	--
Antimony	0.6 - 10	--
Arsenic	1.0 - 4.0	0.1 - 500
Barium	100 - 3,500	10 - 10,000
Beryllium	0.1 - 40	0.1 - 100
Cadmium	0.01 - 7	0.01 - 45
Calcium	100 - 400,000	--
Chromium	5 - 3,000	0.5 - 10,000
Cobalt	1 - 40	0.01 - 500
Copper	2 - 100	0.1 - 14,000
Iron	7,000 - 550,000	--
Lead	2 - 200	0.1 - 3,000
Magnesium	600 - 6,000	--
Manganese	100 - 4,000	1.0 - 70,000
Mercury	0.01 - 0.08	--
Molybdenum	0.2 - 5	0.1 - 400
Nickel	5.0 - 1,000	0.8 - 6,200
Potassium	400 - 30,000	--
Selenium	0.1 - 2	0.01 - 400
Silver	0.1 - 5	0.1 - 50
Sodium	750 - 7,500	400 - 30,000
Thallium	0.1 - 12	--
Titanium	1,000 - 10,000	400 - > 10,000
Vanadium	20 - 500	1 - 1,000
Zinc	10 - 300	3 - 10,000

Source: Dragun, 1988

TABLE 3-3

NAS ALAMEDA - BACKGROUND BORINGS
STATISTICAL ANALYSIS OF METALS RESULTS FOR GROUNDWATER SAMPLES

	Average Concentration	Standard Deviation	Statistical Tolerance Factor	95%/95% Statistical Tolerance Interval ^a	
				Lower Limit (µg/L) ^b	Upper Limit (µg/L)
Aluminum	29.9	19.2	6.37	0	152
Antimony	23.5	9.6	6.37	0	84.5
Arsenic	4.7	5.0	6.37	0	36.3
Barium	245	292	6.37	0	2100
Beryllium	1.3	0	6.37	1.3	1.3
Cadmium	2.0	0	6.37	2.0	2.0
Calcium	83500	39600	6.37	0	336000
Chromium	3.2	0	6.37	3.2	3.2
Cobalt	8.6	0	6.37	8.6	8.6
Copper	3.8	3.8	6.37	0	27.7
Iron	1110	1270	6.37	0	9200
Lead	1.0	0	6.37	1.0	1.0
Magnesium	111000	148000	6.37	0	1050000
Manganese	892	682	6.37	0	5240
Mercury	0.1	0	6.37	0.1	0.1
Nickel	6.6	0	6.37	6.6	6.6
Potassium	40200	42200	6.37	0	309000
Selenium	1.0	0	6.37	1.0	1.0
Silver	2.4	0	6.37	2.4	2.4
Sodium	235000	336000	6.37	0	2380000
Thallium	0.9	0	6.37	0.9	0.9
Vanadium	10.9	9.4	6.37	0	70.7
Zinc	4.0	3.4	6.37	0	25.7

Source: PRC/JMM, 1992c

^a Tolerance Interval = Average ± (Standard Deviation x Statistical Tolerance Factor) (Taylor, 1990)

^b Negative concentrations are rounded to zero.

TABLE 3-4

NATURAL CONCENTRATIONS OF VARIOUS ELEMENTS IN GROUNDWATER

Elements	Typical Range (mg/L)	Extreme Value (mg/L)
Aluminum	< .005 - 1	--
Antimony	--	--
Arsenic	< .001 - .03	4.0
Barium	.01 - .5	--
Beryllium	< .01	--
Cadmium	< .001	--
Calcium	1.0 - 150 ^a , < 500 ^b	95,000 ^c
Chromium	< .001 - .005	--
Cobalt	< .01	--
Copper	< .001 - .03	--
Iron	.01 - 10	> 1,000
Lead	.1 - 5.0	70.0
Magnesium	1 - 50 ^a , < 400 ^b	52,000 ^c
Manganese	< .001 - 1	10
Mercury	< .001	--
Molybdenum	< .001 - .03	10
Nickel	< .01 - .05	--
Potassium	1 - 10	25,000
Selenium	.001 - .01	--
Silver	< .005	--
Sodium	0.5 - 120 ^a , 1,000 ^b	120,000 ^c
Thallium	--	--
Titanium	< .001 - .15	--
Vanadium	< .001 - .01	.07
Zinc	< .01 - 2	--

Source: Dragun, 1988

^a in relatively humid regions^b in relatively dry regions^c in brine

4.0 PHASES 1 AND 2A INVESTIGATIONS DESCRIPTION AND METHODS

As previously mentioned (Section 1), Phases 1 and 2A field investigations were carried out by Canonie in 1990. The following ten sites were studied during these two phases of work:

- Site 1 - 1943 - 1956 Disposal Area
- Site 2 - West Beach Landfill
- Site 3 - Area 97 - Abandoned Fuel Storage Area
- Site 4 - Building 360 - Aircraft Engine Facility
- Site 7C - Building 547 - Service Station
- Site 9 - Building 9 - Paint Stripping
- Site 10B - Building 530 - Missile Rework Operations
- Site 13 - Former Oil Refinery
- Site 16 - CANS C-2 Area
- Site 19 - Yard D-13 - Hazardous Waste Storage Area

The purpose of the investigations was to determine whether soil and groundwater have been impacted by chemicals of concern at these ten sites within NAS Alameda. Methods used in the field portions of the investigations are described in the Phases 1 and 2A Sampling Plans and the Quality Assurance Project Plan (QAPP)-Quality Assurance/Quality Control Plan (QA/QCP) prepared by Canonie (1990b, 1990c, and 1990d, respectively).

According to a February 7, 1991 letter from Canonie to the Department of the Navy, Western Division (WESTDIV), some changes to the above-mentioned sampling plans, QAPP, and QA/QCP were required during the course of the field investigations. The changes consisted of the following:

- The DTSC lowered field QA/QC sample requirements from 10 percent to 5 percent for replicates, sample blanks, and blind samples.
- NAS Alameda did not allow the collection of previously approved samples on or adjacent to the newly repaired runways (inferred to impact Sites 1 and 2).
- At Building 360 (Site 4) site conditions were different from those described in the sampling plan (the differences are not stated in the letter).
- Herbicide analyses were added to the list of authorized analytes for some sites.
- Radium-226 and Radium-228 were analyzed instead of Uranium-226 and Uranium-228, as stated in the sampling plan.

4.1 FOCUS OF INVESTIGATION

The focus of the investigations varied according to activities historically performed at each site. At the majority of the sites, the investigation focused on the sanitary, industrial, and storm sewers as potential conduits for chemicals to enter the soil and/or groundwater. Borings were situated as closely as possible to sewer lines, with particular emphasis at junction locations. Where appropriate (based on a review of past activities), potentially impacted surface areas (e.g., burn areas, wash pads) and other potential subsurface conduits (e.g., underground storage tanks, sumps) were investigated. Background records searches and personal interviews were conducted by E&E as part of the IAS and by Canonie as part of work plan preparation (E&E, 1983; Canonie, 1990c,d). Details of the rationale for identifying sampling locations are discussed in Canonie's sampling plan (1990c,d).

4.2 CHEMICAL ANALYSES

The suite of chemical analyses performed on soil and groundwater samples varied according to past and ongoing activities at each site. Analyses were selected on the basis of known or suspected possible discharges to the sewer systems and known or suspected possible releases to the surface soils. Rationale for selection of chemical analyses is presented in the Canonie work plans (Canonie, 1990c,d). Tables 4-1 and 4-2 summarize the types of chemical analyses and laboratory methods performed on surface and subsurface soil samples and groundwater samples at each site. As indicated in Tables 4-1 and 4-2, surface samples were not analyzed for volatile constituents. This analysis was omitted because volatile constituents are not generally present in surface soils. At each boring, soil samples were collected at 1- to 1.5-foot intervals for chemical analyses. The types of analyses conducted on each soil sampling interval and each groundwater sample is presented in the individual site discussions (Sections 5 through 14). Table 4-3 presents a complete list of compounds detectable by each analysis. Data tables presented in Sections 5 through 14 include the analytical results for those compounds detected in site samples.

TABLE 4-1

SITE-SPECIFIC LABORATORY ANALYSES FOR SOIL

Site		VOC	SVOC	Pest/ PCB	TRPH	Metals	Total Cyanide	Radiation	EDB	Herb.	Asbestos	TOC
1	Surface		X	X	X	X		X				
	Subsurface	X	X	X		X		X			X	X
2	Subsurface	X	X	X		X		X			X	X
3	Surface		X		X	X						X
	Subsurface	X	X		X	X			X			X
4	Surface		X			X	X					X
	Subsurface	X	X			X	X					X
7C	Surface		X	X	X	X						X
	Subsurface	X	X	X	X	X			X			X
9	Surface		X			X						X
	Subsurface	X	X			X						X
10B	Surface		X			X						X
	Subsurface	X	X		X	X						X
13	Surface		X	X		X						X
	Subsurface	X	X	X	X	X						X
16	Surface		X	X		X	X			X		X
	Subsurface	X	X	X		X	X					X
19	Surface		X	X		X	X					X
	Subsurface	X	X	X	X	X	X					X

Note: Refer to Table 4-2 for analytical acronyms.

TABLE 4-2

SITE-SPECIFIC LABORATORY ANALYSES FOR GROUNDWATER

Site	VOC	SVOC	Pest/ PCB	TRPH	Metals	Total Cyanide	EDB	General Minerals	Oil/ Grease	Misc
3	X	X		X	X		X			X
4	X	X		X	X	X		X		X
7C	X	X	X	X	X		X			X
9	X	X			X			X		X
10B	X	X		X	X			X	X	X
13	X	X	X	X	X					X
16	X	X	X	X	X	X		X		X
19	X	X	X	X	X	X		X	X	X

VOC - Volatile Organic Compounds

SVOC - Semivolatile Organic Compounds

PCB - Polychlorinated Biphenyl

TRPH - Total Recoverable Petroleum Hydrocarbons

EDB - Ethylene dibromide

Herb - Herbicides

TOC - Total Organic Carbon

TABLE 4-3

DETECTABLE ANALYTES PER ANALYTICAL METHOD

(Sheet 1 of 2)

VOCs	SVOCs	Pesticides/PCBs	Carbamate/Urea Pesticides	Herbicides	Metals	Dioxin/Furan
1,1,1-Trichloroethane	PAHs	Pesticides	Diuron	2,4,5-T	Aluminum	Tetrachlorodibenzofuran
1,1,2,2-Tetrachloroethane	2,4-Dimethylphenol	4,4'-DDD	Monuron	2,4,5-TP/Silvex	Antimony	Pentachlorodibenzofuran
1,1,2-Trichloroethane	2-Methylnaphthalene	4,4'-DDE		2,4-D	Arsenic	Hexachlorodibenzofuran
1,1-Dichloroethane	2-Methylphenol	4,4'-DDT		2,4-DB	Barium	Heptachlorodibenzofuran
1,1-Dichloroethylene	4-Methylphenol	Aldrin		Dalapon	Beryllium	Octachlorodibenzofuran
1,2-Dichloroethane	Acenaphthene	Dieldrin		Dicamba (Banvel)	Cadmium	Tetrachlorodibenzo-p-dioxin
1,2-Dichloropropane	Acenaphthylene	Endosulfan I		Dichloroprop	Calcium	Pentachlorodibenzo-p-dioxin
2-Hexanone	Anthracene	Endosulfan II		Dinoseb	Chromium	Hexachlorodibenzo-p-dioxin
Acetone	Benzo(a)Anthracene	Endosulfan Sulfate			Cobalt	Heptachlorodibenzo-p-dioxin
Benzene	Benzo(a)Pyrene	Endrin			Copper	Octachlorodibenzo-p-dioxin
Bromodichloromethane	Benzo(b)Fluoranthene	Endrin ketone			Iron	
Bromoform	Benzo(g,h,i)Perylene	Heptachlor			Lead	
Bromomethane	Benzo(k)Fluoranthene	Heptachlor Epoxide			Magnesium	
Carbon Disulfide	Chrysene	MCPA			Manganese	
Carbon Tetrachloride	Dibenzo(a,h)Anthracene	MCPP			Mercury	
Chlorobenzene	Fluoranthene	Methoxychlor			Nickel	
Chloroethane	Fluorene	Toxaphene			Potassium	
Chloroform	Indeno(1,2,3-cd)Pyrene	alpha-BHC			Selenium	
Chloromethane	Naphthalene	alpha-Chlordane			Silver	
Cis-1,3-Dichloropropene	Phenanthrene	beta-BHC			Sodium	
Dibromochloromethane	Phenol	delta-BHC			Thallium	
Ethylbenzene	Pyrene	gamma-BHC (Lindane)			Vanadium	
Methyl Ethyl Ketone	Phthalates	gamma-Chlordane			Zinc	
Methyl Isobutyl Ketone	Bis(2-Ethylhexyl)Phthalate	PCBs				
Methylene Chloride	Butylbenzylphthalate	Aroclor-1016				
Styrene	Di-n-Butyl Phthalate	Aroclor-1221				
Tetrachloroethene	Di-n-Octyl Phthalate	Aroclor-1232				
Toluene	Diethyl Phthalate	Aroclor-1242				
Trans-1,2-Dichloroethene	Dimethyl Phthalate	Aroclor-1248				
Trans-1,3-Dichloropropene	Other SVOCs	Aroclor-1254				
Trichloroethene	1,2,4-Trichlorobenzene	Aroclor-1260				
Vinyl Acetate	1,2-Dichlorobenzene					
Vinyl Chloride	1,3-Dichlorobenzene					
Xylene	1,4-Dichlorobenzene					
	2,4,5-Trichlorophenol					
	2,4,6-Trichlorophenol					
	2,4-Dichlorophenol					

TABLE 4-3

DETECTABLE ANALYTES PER ANALYTICAL METHOD
(Sheet 2 of 2)

VOCs	SVOCs	Pesticides/PCBs	Carbamate/Urea Pesticides	Herbicides	Metals	Dioxin/Furan
	2,4-Dinitrophenol					
	2,4-Dinitrotoluene					
	2,6-Dinitrotoluene					
	2-Chloronaphthalene					
	2-Chlorophenol					
	2-Methyl-4,6-Dinitrophenol					
	2-Nitroaniline					
	2-Nitrophenol					
	3,3-Dichlorobenzidine					
	3-Nitroaniline					
	4-Bromophenyl Phenyl Ether					
	4-Chloro-3-Methylphenol					
	4-Chloroaniline					
	4-Chlorophenylphenyl Ether					
	4-Nitroaniline					
	4-Nitrophenol					
	Benzoic Acid					
	Benzyl Alcohol					
	Bis(2-Chloroisopropyl) Ether					
	Bis(2-Chloroethoxy) Methane					
	Bis(2-Chloroethyl) Ether					
	Dibenzofuran					
	Hexachlorobenzene					
	Hexachlorobutadiene					
	Hexachlorocyclopentadiene					
	Hexachloroethane					
	Isophorone					
	N-Nitrosodi-N-Propylamine					
	N-Nitrosodiphenylamine					
	Nitrobenzene					
	Pentachlorophenol					

VOC - Volatile Organic Compound

SVOC - Semivolatile Organic Compound

PAH - Polycyclic Aromatic Hydrocarbon

Pesticides/PCBs - Pesticides and Polychlorinated Biphenyls

5.0 SITE 1 - 1943-1956 DISPOSAL AREA

5.1 INTRODUCTION

This section summarizes the preliminary phase of the field investigation conducted at Site 1 by Canonie in 1990 as part of the SWAT investigation mandated by the RWQCB in June 1987. A second, and more extensive, phase of the field investigation for the SWAT report was subsequently conducted at Sites 1 and 2 in 1991 by the PRC team. During the 1991 investigation, the PRC team installed 25 groundwater monitoring wells, collected soil samples for geotechnical and chemical analyses, sampled the monitoring wells, conducted surface geophysics, performed aquifer tests at each groundwater well and conducted a tidal influence study from the groundwater monitoring wells installed at Site 1. The data from the second phase was presented in a SWAT report prepared by the PRC team and submitted to the DTSC in September 1992.

The initial intent was to include the data obtained in the Canonie investigation in the SWAT report. Because the Canonie analytical data were not available at the time the SWAT report was completed, only subsurface geologic data generated by the Canonie investigation was incorporated in the SWAT report. This section presents only the results of the chemical analyses performed by Canonie. A comprehensive presentation of the history of fill and disposal operations, geologic/hydrogeologic conditions, and tidal influences, is discussed in the PRC team report titled "Solid Waste Water Quality Assessment Test (SWAT) Report, RI/FS Phases 5 and 6, Draft Final," dated September 1992 (PRC/Montgomery Watson, 1993c).

5.2 SITE DESCRIPTION AND BACKGROUND

Site 1, the 1943-1956 Disposal Area (Initial Assessment Study - Site 2) was a landfill that operated from 1943 until 1956. During its years of operation, Site 1 was the base's main site for waste disposal, and the site reportedly received all waste generated at NAS Alameda except liquid waste, which was discharged directly to the Seaplane Lagoon (E&E, 1983). Site 1 is located in the extreme northwestern corner of NAS Alameda (Figure 5-1).

Canonie reported Site 1 to be approximately 120 acres (Canonie, 1990d). Aerial photographs obtained from Pacific Aerial Surveys indicate that the portion of Site 1 used for landfill operations may be as small as 12 acres. The photographic evidence also suggests that approximately 15 acres were used for the storage of construction and military materials. Details of the photographic investigation are found in the SWAT report (PRC/Montgomery Watson, 1993c).

Although the exact quantity of waste disposed at this site is not known, E&E estimated that a total of 15,000 to 200,000 tons of solid waste have been disposed of at Site 1 (Canonie, 1990d). According to Canonie, wastes known to have been buried at the site include old aircraft engines, kitchen scraps and garbage from ships in port, cables, scrap metal, waste oil, waste paint, waste solvents, cleaning compounds, construction debris, and low-level radiological material.

Historic maps, nautical charts, and aerial photographs indicate that the area that is now Site 1 was covered by the waters of San Francisco Bay until the early 1940s. The 1942 U.S. Coast and Geodetic Survey (USCGS) nautical chart titled "San Francisco Bay, Candlestick Point to Angel Island" shows that, with the exception of the railroad spur along the northern edge, the area now occupied by Site 1 was under 2 to 20 feet of water (USCGS, 1942). Hydraulic filling of this area occurred between the time the 1942 chart was surveyed and the end of 1943. An oblique aerial photograph taken in May 1940 indicates that the hydraulic fill to the east of Site 1 was deposited in linear east-west trending rows from north to south. By September 1940, construction of NAS Alameda was well underway to the east of the present-day runway area (Pacific Aerial Surveys, 1947).

Waste disposal activities reportedly began at Site 1 in 1943. The disposal method at the site consisted of digging trenches in the hydraulic fill to the water table, filling the trenches with waste, and compacting the material with a bulldozer. Cover material was applied to the compacted wastes on an irregular basis. Combustion of waste drums occurred often during bulldozing operations, suggesting that flammable materials were disposed in this area (E&E, 1983).

An aerial photograph from March 24, 1947, shows that disposal activities were underway in the northern one-third of the site (Pacific Aerial Surveys, 1947). The southern two-thirds of the site appear to be freshly filled in the 1947 photograph and no disposal activities are evident.

Beginning in the early 1950s until 1954, the Navy Public Works Department employed open burning as the primary disposal method. Materials received for disposal during this time were burned during the night at the extreme northwest corner of the disposal area and the burnt residue was disposed into San Francisco Bay during the day (E&E, 1983). Aerial photographs from August 14, 1953 and May 3, 1957, show that the 400-foot-long shoreline near the burning area was extended approximately 130 feet westward into San Francisco Bay between these dates (Pacific Aerial Surveys, 1953 and 1957).

In 1952, the construction of Runway 13-31 and the extension of Runway 7-25 necessitated covering the northern portion of Site 1. Spoils stockpiled during the dredging operations of the late 1940s were used as fill

for the 1952 runway development (E&E, 1983). By 1956 the entire Disposal Area was covered with fill, and disposal activities were moved to the West Beach Landfill located immediately to the south.

5.3 CURRENT USE

Most of Site 1 has been paved and is part of the still-active Runways 13-31 and 7-25. Other current uses of Site 1 include military storage and communication, as well as elements of the West Beach Fleet Recreation Area (a skeet range, a target range, and a picnic area). Site personnel frequently use the Perimeter Road, which traverses the perimeter of Site 1, as a running path.

5.4 PREVIOUS INVESTIGATIONS

According to the IAS conducted by E&E (1983), Naval contractors installed 14 wells in 1977 to assess groundwater quality. The groundwater samples were analyzed for oil and grease, sulfides, iron, nitrogen as nitrate, lead, total phosphorus, total nitrogen, and methane derivatives; according to the IAS report, only low concentrations of these compounds were found.

Wahler Associates (Wahler) completed an investigation of Site 1 in late 1984 under the Naval Assessment and Control of Installation Pollutants (NACIP) program. During the 1984 investigation, Wahler installed five groundwater monitoring wells and collected one soil and one groundwater sample from each monitoring well. According to Wahler's 1985 report, the monitoring wells were installed within the hydraulic fill along the western edge of Site 1. Each soil and groundwater sample was analyzed for purgeable hydrocarbons, SVOCs, California Assessment Metals (CAM)-17 metals (antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, molybdenum, nickel, selenium, silver, thallium, vanadium, zinc), and radiation (gross alpha and gross beta) (Wahler, 1985).

Wahler presented the following conclusions and recommendations:

- Elevated concentrations of heavy metals (copper, lead, and zinc) and organic compounds were found in soils near the western boundary of Site 1.
- The metals do not appear to be moving into groundwater, although elevated concentrations of organic compounds, including chlorinated solvents not seen in the soil samples, were found in the groundwater.
- The materials found in the soil and groundwater do not appear to pose an immediate threat to human health or safety.

- The installation of a more thorough groundwater monitoring network is recommended to further characterize the contamination found at the site.

5.5 CANONIE INVESTIGATION

During the initial phase of the SWAT investigation, Canonie collected 76 surface soil samples and drilled two exploratory borings at Site 1. The surface soil samples were collected approximately 200 feet apart across the site; the sample grid had to be adjusted somewhat to account for runways and other features where soil could not be accessed. The surface samples were collected approximately 6 inches below ground surface (bgs) and were analyzed for SVOCs, metals, pesticides and PCBs, and radionuclides; six of the surface samples were analyzed for total recoverable hydrocarbons. A total of 25 subsurface soil samples were collected from two borings drilled at the northern and northwestern borders of the site (Figure 5-1). Samples were submitted for laboratory analysis for VOCs, SVOCs, metals, pesticides and PCBs, pH, total organic carbon (TOC), and radionuclides as well as geotechnical tests. A summary of samples and laboratory analyses is presented in Table 5-1. No groundwater samples were collected at the site.

5.5.1 Site Geology/Hydrogeology

As previously mentioned, a detailed geologic and hydrogeologic discussion is presented in the Phases 5 and 6 SWAT and DSR (PRC/Montgomery Watson, 1993c). Therefore, only a brief summary of site conditions encountered in the two borings drilled during the Canonie subsurface investigation are presented herein. Boring logs for the two borings at Site 1 are presented in Appendix C. Nine geotechnical soil samples were collected and analyzed. Hydraulic conductivity tests were performed on four saturated samples. Table 5-2 provides a summary of the results; the complete geotechnical test results are presented in Appendix D.

Artificial fill consisting of sandy gravel, silty sand and clay was encountered to depths of 23 and 22 feet bgs in borings DA-1 and DA-2, respectively. The Holocene Bay Mud Unit underlies the fill and is 12 feet thick in the two borings. It consists predominantly of silt, silty sand, and clay deposits with sand lenses and layers.

As mentioned in Section 2.0, it is difficult to distinguish between alluvial and eolian (Merritt Sand) deposits underlying the Bay Mud in the vicinity of Sites 1 and 2. Therefore, the sediments underlying the Bay Mud and overlying the late Pleistocene estuarine deposits are referred to as the late Pleistocene/Holocene alluvial/eolian deposits; in the two borings drilled at Site 1, these deposits were 43 feet thick. They consisted predominantly of silty sand.

The late Pleistocene estuarine deposits consisting of silty clay and clay are found below the alluvial/eolian deposits. The two Canonic borings were terminated approximately 5 feet into the clay of the late Pleistocene estuarine deposits.

Groundwater was encountered at depths of 7 and 6 feet bgs in borings DA-1 and DA-2, respectively. Groundwater measurements were not taken as part of the Canonic investigation. A detailed discussion of the hydrogeologic setting beneath Site 1 is presented in the SWAT report (PRC/Montgomery Watson, 1993c).

5.5.2 Analytical Results - Surface Soil Sampling

A total of 76 surface soil samples were taken at Site 1; of these 76 samples, 71 were field samples and 5 were replicate samples. Samples DAR-1, DAR-2, DAR-3, and DAR-4 were replicates of surface samples M5, G8, I2, and B3, respectively. The sampling locations were determined by using a grid pattern, shown on Figure 5-1. Surface soil samples were analyzed for SVOCs, TRPH, pesticide and PCB compounds, metals, and radionuclides.

5.5.2.1 Semivolatile Organic Compounds. Twelve SVOCs were detected in 29 of 76 surface soil samples analyzed for SVOCs. These compounds are phenanthrene, di-n-butylphthalate, fluoranthene, pyrene, benzo(a)anthracene, chrysene, bis(2-ethylhexyl)phthalate, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, indeno(1,2,3-cd)pyrene, and benzo(g,h,i)perylene. Seven of the surface samples contained total SVOCs concentrations above 10 mg/kg. These compounds are summarized in Table 5-4, and are shown on Figure 5-2.

5.5.2.2 Total Recoverable Petroleum Hydrocarbons. Hydrocarbon compounds were detected in six of six surface samples analyzed for TRPH. Table 5-5 lists the samples and Figure 5-3 shows the locations of the six sample locations. All six surface samples contained levels of TRPH over 100 mg/kg.

5.5.2.3 Pesticides/PCBs. Three pesticides (4,4'-DDD [1,1-dichloro-2,2-bis(p-chlorophenyl)ethane], 4,4'-DDE [dichlorodiphenyldichloroethene], and 4,4'-DDT [dichlorodiphenyltrichloroethane]) and two PCBs (Aroclor-1248 and Aroclor-1260) were detected in 24 of 75 surface soil samples analyzed for pesticides/PCBs. The detections of these compounds are listed on Table 5-6 and shown on Figure 5-3. No surface soil samples contained levels of pesticides above 1.0 mg/kg. Five soil samples contained PCBs at levels above 1 mg/kg.

5.5.2.4 Metals. The surface soil samples were analyzed for 23 metals. The results were compared to the 95 percent/95 percent statistical tolerance interval presented for the Runway Area in the SWAT report and

to Native Soil Concentrations of Various Elements (Dragun, 1988). The estimated background ranges of metals in soil are given in Table 3-1 and typical concentration ranges of metals occurring naturally in soil are given in Table 3-2. Fifteen metals exceeded the 95 percent/95 percent upper limit in the surface samples -- aluminum, antimony, arsenic, barium, cadmium, chromium, cobalt, copper, lead, nickel, silver, thallium, vanadium, zinc, and mercury. Table 5-7 lists the detected metals at Site 1. Forty-seven surface soil samples had one or more metals that exceeded the upper limit of the tolerance interval.

All sample results fell within the expected range for native soils except for 28 samples, which are discussed below. Eight metals were detected at concentrations above the expected range but within the extreme range: arsenic, cadmium (four samples), cobalt, copper, lead, molybdenum, silver, and zinc. No extreme range has been established for four other metals that were detected above the typical range; mercury was detected in one sample, DA-1R0 (0.5 foot), at 1 mg/kg, above the expected maximum of 0.08 mg/kg; this sample was a duplicate of DA-1 (1.5 to 2 feet), in which mercury was detected at 0.75 mg/kg. Antimony was detected in one sample at 12 mg/kg, slightly above the maximum of the expected range of 10 mg/kg. Magnesium was detected in one sample at 6,500 mg/kg, slightly above the maximum of the expected range, 6,000 mg/kg. Thallium was detected in one sample at 14 mg/kg, slightly above the maximum of the expected range of 12 mg/kg.

5.5.2.5 Radionuclides. A total of 73 surface soil samples were analyzed for radionuclides. Gross alpha particles were detected at 71 sample locations, gross beta particles were detected at 73 sample locations, and radium-226 and radium-228 were detected at 61 and 50 sample locations respectively. Detections are listed in Table 5-8.

5.5.3 Analytical Results - Subsurface Sampling

A total of 25 soil samples were collected from the two deep borings, DA-1 and DA-2, at Site 1, seven of which were duplicates. Subsurface soil samples were analyzed for VOCs, SVOCs, pesticide/PCB compounds, metals, radionuclides, TOC and pH, and asbestos. Analytical results are summarized in Tables 5-3 through 5-8. Asbestos was not detected in Site 1 soil samples.

5.5.3.1 Volatile Organic Compounds. Six VOCs were detected in all eight of the samples analyzed for VOCs. These six VOCs are methylene chloride, acetone, 2-butanone, 4-methyl-2-pentanone, toluene, and ethylbenzene. These detections are summarized in Table 5-3. Figure 5-2 shows the locations and depths of the samples with detected VOCs. No soil samples contained total VOCs above 1 mg/kg.

5.5.3.2 Semivolatile Organic Compounds. Seven subsurface samples were analyzed for SVOCs. One sample of the three samples analyzed for SVOCs in boring DA-1 contained detectable concentrations of SVOCs. These SVOCs are pyrene, benzo(b)fluoranthene, benzo(a)pyrene, and indeno(1,2,3-cd)pyrene; they are summarized in Table 5-4 and shown on Figure 5-2.

5.5.3.3 Pesticides/PCBs. Two pesticides, 4,4'-DDE and 4,4'-DDT, were detected in one subsurface soil sample. PCBs were not detected in any subsurface soil samples. The detections of these compounds are listed in Table 5-6 and are shown on Figure 5-3. No pesticides were detected at concentrations above the 1 mg/kg level.

5.5.3.4 Metals. Analytical results were compared to the 95 percent/95 percent statistical tolerance interval presented for the Runway Area in the SWAT report and to the expected values of metals in native soils (Dragun, 1988). Eleven metals were detected above the 95 percent/95 percent statistical tolerance interval upper limit: aluminum, arsenic, barium, cadmium, chromium, copper, lead, nickel, vanadium, zinc, and mercury. One or more of these metals was detected in five of the seven subsamples analyzed for metals. The detections of these metals are listed in Table 5-6. Five metals, arsenic, cadmium, copper, sodium, and zinc, were detected in two subsurface samples above the typical range but below the extreme range. Two elements for which no extreme range has been established, magnesium in two samples and mercury in one sample, were detected at concentrations above the typical range.

5.5.3.5 Radionuclides. Gross alpha particles and gross beta particles were detected in all ten of the subsurface samples analyzed for radionuclides; radium 226 and radium 228 were detected in nine and five subsurface samples, respectively, and they are listed in Table 5-8.

5.5.3.6 Total Organic Carbon and pH. Four subsurface samples were analyzed for TOC, two field samples and two duplicates. Three surface and eight subsurface soil samples were analyzed for pH. Table 5-5 summarizes the TOC and pH data. TOC data are shown on Figure 5-3.

5.6 SUMMARY AND CONCLUSIONS

The purpose of the data summary report is to provide a qualitative assessment of the Canonic data to identify whether sufficient information has been collected for the RI/FS evaluation. As discussed in Section 3, QA/QC information is not available for the data validation; therefore, the data presented in this report have not been validated under EPA Contract Laboratory Program (CLP) procedures.

A total of 101 surface and subsurface samples were collected by Canonie. Surface samples were collected from a modified grid in the artificial fill, and samples from the fill, the Holocene Bay Mud Unit, and the Merritt Sand unit were collected from two borings: DA-1, in the northwest corner of the site, and DA-2, located near the northeast corner of the site. The borings were drilled to 90.0 and 92.0 feet, respectively. VOCs, SVOCs, metals, pesticides/PCBs, radionuclides, and TRPH were detected in the Site 1 soil samples. In addition, pH was measured in 11 samples and TOC was analyzed in four subsurface soil samples. No asbestos was detected in the two soil samples analyzed for asbestos at Site 1. No groundwater samples were collected at this site during the Canonie investigation.

Only subsurface soil samples collected from borings DA-1 and DA-2 were analyzed for VOCs. Methylene chloride was detected at less than 32 micrograms per kilogram ($\mu\text{g}/\text{kg}$) in all eight samples analyzed for VOCs; no other VOCs were detected in samples from DA-2. In samples from DA-1, five other VOCs were each detected (at less than 57 $\mu\text{g}/\text{kg}$) once. The distribution of VOCs at this site (particularly methylene chloride) suggest that one or more of the detected VOCs may be laboratory artifacts. No soil sample contained total VOCs above the 1 mg/kg level.

The SVOCs, primarily polycyclic aromatic hydrocarbons (PAH) and phthalates, were detected in surface soil samples along the southern and western edges of the site. In only one subsurface sample, from DA-1, were SVOCs (four PAH) detected, possibly from natural sources (ashes or other combustion products). A total of eight soil samples contained total SVOC concentrations above the 10 mg/kg preliminary comparison level. Seven of the eight soil samples are surface soil samples collected along the western edge of the site.

Six surface soil samples had detectable concentrations of TRPH. Four of the samples were taken from south of Runway 7-25 and west of Runway 13-31; the other two samples were from west of Runway 13-31 and north of Runway 7-25. All six soil samples contained TRPH concentrations above 100 mg/kg. These six samples were surface soil samples collected along the southern and western edges of the site.

Three pesticides and two PCBs were detected in surface samples from areas west of Runway 13-31. These compounds were not detected below 2 feet in the two soil borings. No soil sample contained a pesticide concentration above 1 mg/kg. Six soil samples which were collected at the surface contained PCB concentrations above 1 mg/kg.

Fifteen metals are present in the surface and subsurface soil samples at concentrations exceeding the 95 percent/95 percent statistical tolerance interval of background concentrations at NAS Alameda (from the SWAT report [PRC/Montgomery Watson, 1993c]). All fifteen metals were detected in the surface samples. Eight metals were detected in surface soil samples above the typical range (Dragun, 1988) but within the extreme

range for native soils. The significance of the presence of metals above background levels will be further evaluated during the risk assessment to be performed during the comprehensive RI/FS process.

If the analytical results can be validated and are considered to be acceptable, the following conclusions can be made:

- SVOCs, metals, pesticides and PCBs, and TRPH were detected in the surface soil samples. According to site history, the surface soil is likely to be composed of the hydraulic fill from the former oil refinery area that was placed to cover the buried landfill material. Therefore, these detectable chemicals may have been present in the hydraulic fill prior to being placed at Site 1. Sufficient soil data have not been collected for the area around boring DA-2 and the "Alpha Area" to characterize the surface soil at Site 1.
- One surface soil sample collected from boring DA-2 was found to contain the PCB Aroclor-1248 above 1 mg/kg. Aroclor-1260 was also detected above 1 mg/kg at DA-1, L0, L1, M1, and G4. Additional surface soil samples may be necessary to further characterize the extent of PCBs in the vicinity of these samples.

The significance of the presence of these VOCs, SVOCs, TRPH, pesticides and PCBs, and metals in the soil is further evaluated in the SWAT and DSR (PRC/Montgomery Watson, 1993c). The Canonic data together with the data collected during the SWAT investigation performed by the PRC team have been assessed to determine the need for follow-on sampling. The conclusions and recommendations are presented in the Phases 5 and 6 field sampling plan for the follow-on investigation (PRC/Montgomery Watson, 1993a). An evaluation of all data collected at Site 1 will be conducted during the risk assessment to be performed during the comprehensive RI/FS work.

TABLE 5-1

SITE 1 - 1943-1956 DISPOSAL AREA
SUMMARY OF LABORATORY ANALYSES PERFORMED ON SOIL SAMPLES
(Sheet 1 of 4)

Boring	Depth	Matrix	Alkalinity/Acidity	Ammonia	Ammonium	Asbestos (Tot)	Ash (Tot)	SVOC	BTU Value	Cations/Anions	CEC	Cyanide (Tot)	DO (Tot)	EDB	Herb Uniq	Herbicides	Mercury	Metals	Pes/PCB	pH	Phosphorous	Potassium	Radiation	Spec. Con.	Kjeldahl Nitrogen	TOC	TRPH	TS/TDS	VOC
A1	0.0	Soil					.									.	.				.
A2	0.0	Soil					.									.	.				.
A3	0.0	Soil					.									.	.				.
A4	0.0	Soil					.									.	.				.
A5	0.0	Soil					.									.	.				.
A6	0.0	Soil					.									.	.				.
A7	0.0	Soil					.									.	.				.					.
A8	0.0	Soil					.									.	.				.					.
B2	0.0	Soil					.									.	.				.					.
B3	0.0	Soil					.									.	.				.					.
B4	0.0	Soil					.									.	.				.					.
B5	0.0	Soil					.									.	.				.					.
B6	0.0	Soil					.									.	.				.					.
B7	0.0	Soil					.									.	.				.					.
B8	0.0	Soil					.									.	.				.					.
DA-1	0.0-0.5	Soil					.								.	.	.	.			.					.
DA-1	0.5-1.0	Soil			.		.								.	.	.	.			.			.		.
DA-1	1.5-2.0	Soil					.								.	.	.	.			.					.
DA-1	25.0-25.5	Soil					.								.	.	.	.			.					.
DA-1	25.5-26.0	Soil					.								.	.	.	.			.					.
DA-1	26.0-26.5	Soil					.								.	.	.	.			.					.
DA-1	50.0-50.5	Soil					.								.	.	.	.			.					.
DA-1R	0.0-0.5	Soil					.								.	.	.	.			.					.
DA-1R	0.5-1.0	Soil					.								.	.	.	.			.					.
DA-1R	1.0-1.5	Soil					.								.	.	.	.			.			.		.
DA-1R	1.5-2.0	Soil					.								.	.	.	.			.			.		.
DA-2	0.0-0.5	Soil					.								.	.	.	.			.					.

TABLE 5-1

SITE 1 - 1943-1956 DISPOSAL AREA
SUMMARY OF LABORATORY ANALYSES PERFORMED ON SOIL SAMPLES
 (Sheet 2 of 4)

Boring	Depth	Matrix	Alkalinity/Acidity	Ammonia	Ammonium	Asbestos (Tox)	Ash (Tox)	SVOC	BTU Value	Cations/Anions	CEC	Cyanide (Tox)	DO (Tox)	EDB	Herb Uniq	Herbicides	Mercury	Metals	Pes/PCB	pH	Phosphorous	Potassium	Radiation	Spec. Con.	Kjeldahl Nitrogen	TOC	TRPH	TS/TDS	VOC
DA-2	0.5-1.0	Soil																				•							
DA-2	2.0-2.5	Soil			•																								
DA-2	2.5-3.0	Soil																							•				
DA-2	12.0-12.5	Soil																											•
DA-2	12.5-13.0	Soil					•								•	•	•	•											
DA-2	13.0-13.5	Soil																				•							
DA-2	25.0-25.5	Soil					•																						•
DA-2	25.5-26.0	Soil					•								•	•	•	•											
DA-2	26.0-26.5	Soil																				•							
DA-2	39.0-39.5	Soil																											•
DA-2	39.5-40.0	Soil					•								•	•	•	•											
DA-2	40.0-40.5	Soil																				•							
DA-2R	2.0-2.5	Soil					•								•	•	•	•											
DA-2R	2.5-3.0	Soil																				•							
DA-2R	3.0-3.5	Soil																						•					
DA-2R	3.5-4.0	Soil																											•
DAR-1	0.0	Soil					•									•	•					•							
DAR-2	0.0	Soil					•									•	•					•							
DAR-3	0.0	Soil					•									•	•					•							
DAR-4	0.0	Soil					•									•	•					•							
F1	0.0	Soil					•									•	•					•							
F2	0.0	Soil					•									•	•					•							
F3	0.0	Soil					•									•	•					•							
F4	0.0	Soil					•									•	•					•							
F5	0.0	Soil					•									•	•					•							
F6	0.0	Soil					•									•	•					•							
F9	0.0	Soil					•									•	•					•							

TABLE 5-1

SITE 1 - 1943-1956 DISPOSAL AREA
SUMMARY OF LABORATORY ANALYSES PERFORMED ON SOIL SAMPLES
(Sheet 3 of 4)

Boring	Depth	Matrix	Alkalinity/Acidity	Ammonia	Ammonium	Asbestos (Tot)	Ash (Tot)	SVOC	BTU Value	Cations/Anions	CEC	Cyanide (Tot)	DO (Tot)	EDB	Herb Uniq	Herbicides	Mercury	Metals	Pest/PCB	pH	Phosphorous	Potassium	Radiation	Spec. Con.	Kjeldahl Nitrogen	TOC	TRPH	TS/TDS	VOC
F10	0.0	Soil				.											.	.				.
G1	0.0	Soil				.											.	.				.
G2	0.0	Soil				.											.	.				.			.
G3	0.0	Soil				.											.	.				.
G4	0.0	Soil				.											.	.				.
G5	0.0	Soil				.											.	.				.
G8	0.0	Soil				.											.	.				.
G9	0.0	Soil				.											.	.				.
G10	0.0	Soil				.											.	.				.
H1	0.0	Soil				.											.	.				.			.
H2	0.0	Soil				.											.	.				.
H3	0.0	Soil				.											.	.				.
H4	0.0	Soil				.											.	.				.
H8	0.0	Soil				.											.	.				.
H9	0.0	Soil				.											.	.				.
I2	0.0	Soil				.											.	.				.
I3	0.0	Soil				.											.	.				.
I4	0.0	Soil				.											.	.				.
I7	0.0	Soil				.											.	.				.
I8	0.0	Soil				.											.	.				.
J1	0.0	Soil				.											.	.				.
J2	0.0	Soil				.											.	.				.
J3	0.0	Soil				.											.	.				.
J7	0.0	Soil				.											.	.				.
J8	0.0	Soil				.											.	.				.
K0	0.0	Soil				.											.	.				.
K1	0.0	Soil				.											.	.				.

TABLE 5-1

SITE 1 - 1943-1956 DISPOSAL AREA
SUMMARY OF LABORATORY ANALYSES PERFORMED ON SOIL SAMPLES
 (Sheet 4 of 4)

Boring	Depth	Matrix	Alkalinity/Acidity	Ammonia	Ammonium	Asbestos (Tot)	Ash (Tot)	SVOC	BTU Value	Cations/Anions	CEC	Cyanide (Tot)	DO (Tot)	EDB	Herb Uniq	Herbicides	Mercury	Metals	Pest/PCB	pH	Phosphorous	Potassium	Radiation	Spec. Con.	Kjeldahl Nitrogen	TOC	TRPH	TS/TDS	VOC
K2	0.0	Soil				.										.	.				.
K6	0.0	Soil				.										.	.				.
K7	0.0	Soil				.										.	.				.
L0	0.0	Soil				.										.	.				.
L1	0.0	Soil				.										.	.				.
L2	0.0	Soil				.										.	.				.
L3	0.0	Soil				.										.	.				.
L6	0.0	Soil				.										.	.				.
L7	0.0	Soil				.										.	.				.
M0	0.0	Soil				.										.	.				.
M1	0.0	Soil				.										.	.				.
M4	0.0	Soil				.										.	.				.
M5	0.0	Soil				.										.	.				.
M6	0.0	Soil				.										.	.				.
M7	0.0	Soil				.										.	.				.
M8	0.0	Soil				.										.	.				.
M9	0.0	Soil				.										.	.				.
M10	0.0	Soil				.										.	.				.
N0	0.0	Soil				.										.	.				.
O0	0.0	Soil				.										.	.				.
Summary		Soil			2	83									10	82	82	11			83			4	6		8		

Notes:

Analysis	Methods	Matrix
TOC	29-3.52	soil
Asbestos	Asbestos	soil
TRPH	EPA 418.1	soil

Analysis	Methods	Matrix
Pest/PCB	EPA 608	soil
Pest/PCB	EPA 8080	soil
VOC	EPA 8240	soil
SVOC	EPA 8270	soil

Analysis	Methods	Matrix
Metals	EPA 6010	soil
Mercury	EPA 7471	soil
pH	EPA 9045	soil
Radiation	Radiation	soil

TABLE 5-2

**SITE 1 - 1943-1956 DISPOSAL AREA
GEOTECHNICAL SAMPLE LABORATORY TEST RESULTS**

Sample No.	Depth (ft)	Soil Classification		Moisture Content (%)	Dry Density (pcf)	Specific Gravity	Hydraulic Conductivity (cm/s)
		Laboratory	Field				
DA-1R	0	SM	GP	3.5	104.6	2.59	1.0E-05
DA-1	26.5	CL	CL	39.4	79.0	NA	NA
DA-1	54	SM/SP	SM	20.0	104.7	NA	2.0E-06
DA-2R	0	SM	SM	12.5	90.9	NA	NA
DA-2R	1	SM	SM	7.7	92.2	NA	6.0E-04
DA-2	10	CL	CL	63.9	62.0	NA	NA
DA-2	27	SP	SM	17.9	114.4	NA	3.0E-05
DA-2	41	SM	SM	18.7	114.3	2.68	3.0E-07
DA-2	80	SP	SP	19.6	108.6	NA	1.0E-03

Notes:

NA - Not Analyzed

Parameters not detected are reported as less than method detection limit.

Laboratory Methods (Units):

Soil Classification - Unified Soil Classification System (USCS) - ASTM D2488

Moisture Content - ASTM D2216 (percent)

Dry Density - ASTM D2937 (pounds per cubic foot)

Specific Gravity - ASTM D854

Hydraulic Conductivity - EPA 9100 (centimeters per second)

Soil Classification Legend:

GW	Well graded gravels, gravel-sand mixtures, little or no fines	SM	Silty sands, sand-silt mixtures
GP	Poorly graded gravels, gravel-sand mixtures, little or no fines	SC	Clayey sands, sand-clay mixtures
GM	Silty gravels, gravel-sand-silt mixtures	ML	Inorganic silts and very fine sands, rock flow silty or clayey fine sands or clayey silts with slight plasticity
GC	Clayey gravels, gravel-sand-clay mixtures	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
SW	Well graded sands, gravelly sands, little or no fines	OL	Organic silts and organic silty clays or low plasticity
SP	Poorly-graded sands, gravelly sands, little or no fines	CH	Inorganic clays of high plasticity, fat clays

TABLE 5-3

SITE 1 - 1943-1956 DISPOSAL AREA
RESULTS FOR VOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES

Parameter Reported	DA-1 05/16/90 1.5-2 ft	DA-1 05/16/90 25-25.5 ft	DA-1 05/16/90 50-50.5 ft	DA-1R 05/23/90 1.5-2 ft	DA-2 05/18/90 12-12.5 ft	DA-2 05/18/90 25-25.5 ft	DA-2 05/18/90 39-39.5 ft
Methylene Chloride (ug/kg)	32	27	14	14	15	16	14
Acetone (ug/kg)	<11.0	<18.0	57	<11.0	<14.0	<14.0	<12.0
2-Butanone (ug/kg)	<11.0	<18.0	16	<11.0	<14.0	<14.0	<12.0
4-Methyl-2-pentanone (ug/kg)	<5.60	<9.00	6	<5.50	<6.80	<7.20	<6.10
Toluene (ug/kg)	9	<9.00	<6.00	<5.50	<6.80	<7.20	<6.10
Ethylbenzene (ug/kg)	<5.60	13	<6.00	<5.50	<6.80	<7.20	<6.10

Parameter Reported	DA-2R 05/23/90 3.5-4 ft
Methylene Chloride (ug/kg)	19
Acetone (ug/kg)	<16.0
2-Butanone (ug/kg)	<16.0
4-Methyl-2-pentanone (ug/kg)	<7.80
Toluene (ug/kg)	<7.80
Ethylbenzene (ug/kg)	<7.80

Notes: NA = Not Analyzed
 < = Detection Limit
 ug/kg = micrograms per kilogram
 Data not validated by JMM

TABLE 5-4

SITE 1 - 1943-1956 DISPOSAL AREA
RESULTS FOR SEMIVOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
 (Sheet 1 of 5)

Parameter Reported	A4 05/03/90 0-0 ft	A5 05/03/90 0-0 ft	A7 05/03/90 0-0 ft	A8 05/03/90 0-0 ft	B3 05/03/90 0-0 ft	DA-1 05/16/90 25-25.5 ft	DA-2 05/18/90 0-0.5 ft
Phenanthrene (ug/kg)	<700	<700	<680	<670	<680	<2400	<700
Di-n-butylphthalate (ug/kg)	930	2000	700	1100	1100	<2400	<700
Fluoranthene (ug/kg)	<700	<700	<680	<670	<680	<2400	<700
Pyrene (ug/kg)	<700	<700	<680	<670	<680	8300	<700
Benzo(a)anthracene (ug/kg)	<700	<700	<680	<670	<680	<2400	<700
Chrysene (ug/kg)	<700	<700	<680	<670	<680	<2400	<700
bis(2-Ethylhexyl)phthalate (ug/kg)	<700	<700	<680	<670	<680	<2400	8500
Benzo(b)fluoranthene (ug/kg)	<700	<700	<680	<670	<680	4000	<700
Benzo(k)fluoranthene (ug/kg)	<700	<700	<680	<670	<680	<2400	<700
Benzo(a)pyrene (ug/kg)	<700	<700	<680	<670	<680	5800	<700
Indeno(1,2,3-cd)pyrene (ug/kg)	<700	<700	<680	<670	<680	2700	<700
Benzo(g,h,i)perylene (ug/kg)	<700	<700	<680	<670	<680	<2400	<700

Notes: NA = Not Analyzed

< = Detection Limit

ug/kg = micrograms per kilogram

Data not validated by JMM

TABLE 5-4

SITE 1 - 1943-1956 DISPOSAL AREA
RESULTS FOR SEMIVOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 2 of 5)

Parameter Reported	DAR-3 05/12/90 0-0 ft	F1 05/16/90 0-0 ft	F2 05/03/90 0-0 ft	F4 05/03/90 0-0 ft	F9 05/04/90 0-0 ft	G1 05/03/90 0-0 ft	G8 05/04/90 0-0 ft
Phenanthrene (ug/kg)	<1400	<680	<680	<720	<660	<3400	<730
Di-n-butylphthalate (ug/kg)	<1400	<680	980	<720	970	<3400	1200
Fluoranthene (ug/kg)	3200	790	<680	<720	<660	<3400	<730
Pyrene (ug/kg)	3200	900	<680	<720	<660	3700	<730
Benzo(a)anthracene (ug/kg)	2000	<680	<680	<720	<660	<3400	<730
Chrysene (ug/kg)	3000	<680	<680	<720	<660	3400	<730
bis(2-Ethylhexyl)phthalate (ug/kg)	<1400	<680	<680	720	<660	<3400	<730
Benzo(b)fluoranthene (ug/kg)	2700	<680	<680	<720	<660	6300	<730
Benzo(k)fluoranthene (ug/kg)	<1400	<680	<680	<720	<660	<3400	<730
Benzo(a)pyrene (ug/kg)	3600	<680	<680	<720	<660	<3400	<730
Indeno(1,2,3-cd)pyrene (ug/kg)	1800	<680	<680	<720	<660	<3400	<730
Benzo(g,h,i)perylene (ug/kg)	1400	<680	<680	<720	<660	<3400	<730

Notes: NA = Not Analyzed

< = Detection Limit

ug/kg = micrograms per kilogram

DAR-3 is a replicate for Sample 12 0-0 ft.

Data not validated by JMM

TABLE 5-4

SITE 1 - 1943-1956 DISPOSAL AREA
 RESULTS FOR SEMIVOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
 (Sheet 3 of 5)

Parameter Reported	H1 05/04/90 0-0 ft	H2 05/04/90 0-0 ft	H3 05/04/90 0-0 ft	I2 05/04/90 0-0 ft	J1 05/04/90 0-0 ft	J2 05/04/90 0-0 ft	K0 05/16/90 0-0 ft
Phenanthrene (ug/kg)	5700	<710	1600	<680	<670	680	3600
Di-n-butylphthalate (ug/kg)	<3400	<710	<680	<680	<670	<670	<3400
Fluoranthene (ug/kg)	13000	<710	2900	1100	<670	1700	17000
Pyrene (ug/kg)	12000	710	2200	980	<670	1600	21000
Benzo(a)anthracene (ug/kg)	9900	<710	1100	<680	<670	910	17000
Chrysene (ug/kg)	13000	<710	1400	<680	<670	1200	20000
bis(2-Ethylhexyl)phthalate (ug/kg)	<3400	<710	820	<680	1300	1400	<3400
Benzo(b)fluoranthene (ug/kg)	10000	1100	2400	1000	840	2300	<3400
Benzo(k)fluoranthene (ug/kg)	<3400	<710	<680	<680	<670	<670	24000
Benzo(a)pyrene (ug/kg)	15000	<710	1200	<680	<670	1200	<3400
Indeno(1,2,3-cd)pyrene (ug/kg)	<3400	<710	<680	<680	<670	<670	<3400
Benzo(g,h,i)perylene (ug/kg)	<3400	<710	<680	<680	<670	<670	<3400

Notes: NA = Not Analyzed

< = Detection Limit

ug/kg = micrograms per kilogram

Data not validated by JMM

TABLE 5-4

SITE 1 - 1943-1956 DISPOSAL AREA
RESULTS FOR SEMIVOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 4 of 5)

Parameter Reported	K1 05/16/90 0-0 ft	K2 05/04/90 0-0 ft	L0 05/16/90 0-0 ft	L1 05/04/90 0-0 ft	L2 05/04/90 0-0 ft	L5 05/04/90 0-0 ft	M0 05/04/90 0-0 ft
Phenanthrene (ug/kg)	<680	<670	<1400	<1300	<670	<700	<670
Di-n-butylphthalate (ug/kg)	<680	2500	<1400	7300	910	<700	1600
Fluoranthene (ug/kg)	<680	<670	4600	<1300	<670	<700	<670
Pyrene (ug/kg)	810	<670	4300	<1300	<670	<700	<670
Benzo(a)anthracene (ug/kg)	<680	<670	1900	<1300	<670	<700	<670
Chrysene (ug/kg)	910	<670	2800	<1300	<670	<700	<670
bis(2-Ethylhexyl)phthalate (ug/kg)	<680	<670	<1400	<1300	<670	720	<670
Benzo(b)fluoranthene (ug/kg)	<680	<670	2000	<1300	<670	<700	<670
Benzo(k)fluoranthene (ug/kg)	<680	<670	1600	<1300	<670	<700	<670
Benzo(a)pyrene (ug/kg)	<680	<670	2100	<1300	<670	<700	<670
Indeno(1,2,3-cd)pyrene (ug/kg)	<680	<670	1600	<1300	<670	<700	<670
Benzo(g,h,i)perylene (ug/kg)	<680	<670	1800	<1300	<670	<700	<670

Notes: NA = Not Analyzed

< = Detection Limit

ug/kg = micrograms per kilogram

Data not validated by JMM

TABLE 5-4

SITE 1 - 1943-1956 DISPOSAL AREA
 RESULTS FOR SEMIVOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
 (Sheet 5 of 5)

Parameter Reported	N0	O0
	05/04/90 0-0 ft	05/04/90 0-0 ft
Phenanthrene (ug/kg)	<680	<680
Di-n-butylphthalate (ug/kg)	880	7800
Fluoranthene (ug/kg)	<680	<680
Pyrene (ug/kg)	<680	<680
Benzo(a)anthracene (ug/kg)	<680	<680
Chrysene (ug/kg)	<680	<680
bis(2-Ethylhexyl)phthalate (ug/kg)	<680	<680
Benzo(b)fluoranthene (ug/kg)	<680	<680
Benzo(k)fluoranthene (ug/kg)	<680	<680
Benzo(a)pyrene (ug/kg)	<680	<680
Indeno(1,2,3-cd)pyrene (ug/kg)	<680	<680
Benzo(g,h,i)perylene (ug/kg)	<680	<680

Notes: NA = Not Analyzed

< = Detection Limit

ug/kg = micrograms per kilogram

Data not validated by JMM

TABLE 5-5

SITE 1 - 1943-1956 DISPOSAL AREA
RESULTS FOR TOTAL RECOVERABLE PETROLEUM HYDROCARBONS,
TOTAL ORGANIC CARBON AND pH DETECTED IN SOIL SAMPLES

	A7	A8	B2	B3	G2	H1	
	05/03/90	05/03/90	05/03/90	05/03/90	05/03/90	05/04/90	
Parameter Reported	0-0 ft	0-0 ft	0-0 ft	0-0 ft	0-0 ft	0-0 ft	
TRPH (mg/kg)	230	390	240	110	110	850	
	DA-1	DA-1R	DA-2	DA-2R			
	05/16/90	05/23/90	05/18/90	05/23/90			
Parameter Reported	0.5-1 ft	1-1.5 ft	2.5-3 ft	3-3.5 ft			
Total Organic Carbon (%)	1.1	0.21	0.34	0.33			
	DA-1	DA-1	DA-1	DA-1	DA-1	DA-1R	DA-2
	05/16/90	05/16/90	05/16/90	05/16/90	05/16/90	05/23/90	05/18/90
Parameter Reported	0-0.5 ft	1.5-2 ft	25-25.5 ft	26-26.5 ft	50-50.5 ft	0-0.5 ft	0-0.5 ft
pH (Units)	8.4	9.2	8.6	7.9	8.3	7.7	8.5
	DA-2	DA-2	DA-2	DA-2R			
	05/18/90	05/18/90	05/18/90	05/23/90			
Parameter Reported	12.5-13 ft	25.5-26 ft	39.5-40 ft	2-2.5 ft			
pH (Units)	8.7	8	7.5	8			

Notes: NA = Not Analyzed
 < = Detection Limit
 mg/kg = milligrams per kilogram
 Data not validated by JMM

TABLE 5-6

SITE 1 - 1943-1956 DISPOSAL AREA
RESULTS FOR PESTICIDE AND PCB COMPOUNDS DETECTED IN SOIL SAMPLES
 (Sheet 1 of 2)

Parameter Reported	A1 05/03/90 0-0 ft	B2 05/03/90 0-0 ft	B3 05/03/90 0-0 ft	DA-1 05/16/90 0-0.5 ft	DA-1 05/16/90 1.5-2 ft	DA-1R 05/23/90 0-0.5 ft	DA-2 05/18/90 0-0.5 ft
4,4'-DDD (ug/kg)	<10.0	<2.00	<2.00	<22.0	<22.0	<22.0	<21.0
4,4'-DDE (ug/kg)	<10.0	<2.00	<2.00	<22.0	64	<22.0	<21.0
4,4'-DDT (ug/kg)	<10.0	3	3.3	28	450	<22.0	<21.0
Aroclor-1248 (ug/kg)	<130	<25.0	<26.0	<270	<280	<280	1200
Aroclor-1260 (ug/kg)	370	<50	<51	<540	<560	1200	<530

Parameter Reported	DAR-3 05/12/90 0-0 ft	F1 05/16/90 0-0 ft	F2 05/03/90 0-0 ft	F3 05/03/90 0-0 ft	F6 05/03/90 0-0 ft	G4 05/03/90 0-0 ft	H2 05/04/90 0-0 ft
4,4'-DDD (ug/kg)	<21.0	<21.0	<10.0	3.8	<2.00	<44.0	<43.0
4,4'-DDE (ug/kg)	21	<21.0	<10.0	3.3	<2.00	<44.0	51
4,4'-DDT (ug/kg)	140	110	47	3.9	5.5	<44.0	89
Aroclor-1248 (ug/kg)	<260	<260	<130	<30.0	<26.0	<550	<540
Aroclor-1260 (ug/kg)	<530	<520	<260	<61	<52	3200	<1100

Notes: NA = Not Analyzed
 < = Detection Limit
 ug/kg = micrograms per kilogram
 Data not validated by JMM

TABLE 5-6

SITE 1 - 1943-1956 DISPOSAL AREA
RESULTS FOR PESTICIDE AND PCB COMPOUNDS DETECTED IN SOIL SAMPLES
 (Sheet 2 of 2)

Parameter Reported	H3 05/04/90 0-0 ft	I2 05/04/90 0-0 ft	I3 05/04/90 0-0 ft	I4 05/04/90 0-0 ft	J2 05/04/90 0-0 ft	L0 05/16/90 0-0 ft	L1 05/04/90 0-0 ft
4,4'-DDD (ug/kg)	<20.0	<20.0	<20.0	<10.0	<20.0	<21.0	<20.0
4,4'-DDE (ug/kg)	<20.0	<20.0	<20.0	<10.0	<20.0	<21.0	<20.0
4,4'-DDT (ug/kg)	37	41	<20.0	11	100	36	<20.0
Aroclor-1248 (ug/kg)	<260	<260	<250	<130	<250	<260	<250
Aroclor-1260 (ug/kg)	<510	<510	600	<250	<500	1000	1200

Parameter Reported	M1 05/04/90 0-0 ft	M9 05/16/90 0-0 ft	N0 05/04/90 0-0 ft	O0 05/04/90 0-0 ft
4,4'-DDD (ug/kg)	<100	<10.0	<21.0	<21.0
4,4'-DDE (ug/kg)	<100	<10.0	<21.0	<21.0
4,4'-DDT (ug/kg)	<100	11	<21.0	<21.0
Aroclor-1248 (ug/kg)	<1300	<130	<260	<260
Aroclor-1260 (ug/kg)	4100	<260	680	800

Notes: NA = Not Analyzed
 < = Detection Limit
 ug/kg = micrograms per kilogram
 Data not validated by JMM

TABLE 5-7

SITE 1 - 1943-1956 DISPOSAL AREA
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
 (Sheet 1 of 12)

Parameter Reported	A1 05/03/90 0-0 ft	A2 05/03/90 0-0 ft	A3 05/03/90 0-0 ft	A4 05/03/90 0-0 ft	A5 05/03/90 0-0 ft	A6 05/03/90 0-0 ft	A7 05/03/90 0-0 ft
Aluminum (mg/kg)	5870	4590	4710	4850	4980	5810	5520
Antimony (mg/kg)	<6.20	<6.20	<6.00	<6.30	<6.40	<6.50	<6.20
Arsenic (mg/kg)	<10.0	<10.0	<10.0	<11.0	<11.0	<11.0	<10.0
Barium (mg/kg)	47	25	27	26	32	30	35
Cadmium (mg/kg)	3.1	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
Calcium (mg/kg)	3600	2900	2800	3200	2800	4300	3000
Chromium (mg/kg)	37	31	31	32	31	31	31
Cobalt (mg/kg)	5.4	<5.10	<5.00	<5.30	<5.30	<5.40	<5.10
Copper (mg/kg)	27	11	11	9.8	7.8	12	14
Iron (mg/kg)	11300	7900	8420	8470	8680	9420	9400
Lead (mg/kg)	62	9.2	12	21	14	27	34
Magnesium (mg/kg)	2800	1900	2200	2300	2300	2600	2600
Manganese (mg/kg)	150	94	100	110	92	140	98
Molybdenum (mg/kg)	<5.10	<5.10	<5.00	<5.30	<5.30	<5.40	<5.10
Nickel (mg/kg)	33	22	23	24	26	27	28
Potassium (mg/kg)	810	670	640	620	690	890	870
Silver (mg/kg)	<5.10	10	<5.00	<5.30	<5.30	<5.40	<5.10
Sodium (mg/kg)	<510	<510	<500	<530	<530	<540	<510
Thallium (mg/kg)	<10.0	<10.0	<10.0	<11.0	<11.0	<11.0	<10.0
Titanium (mg/kg)	400	440	430	450	450	450	440
Vanadium (mg/kg)	25	21	21	22	21	24	23
Zinc (mg/kg)	83	24	29	32	68	43	61
Mercury (mg/kg)	NA	NA	NA	NA	NA	NA	NA

Notes: NA = Not Analyzed
 < = Detection Limit
 mg/kg = milligrams per kilogram
 Data not validated by JMM

TABLE 5-7

SITE 1 - 1943-1956 DISPOSAL AREA
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
 (Sheet 2 of 12)

Parameter Reported	A8 05/03/90 0-0 ft	B2 05/03/90 0-0 ft	B3 05/03/90 0-0 ft	B4 05/03/90 0-0 ft	B5 05/03/90 0-0 ft	B6 05/03/90 0-0 ft	B7 05/03/90 0-0 ft
Aluminum (mg/kg)	5220	5490	4240	4380	4870	4880	4160
Antimony (mg/kg)	<6.10	<6.00	<6.20	<6.10	<6.30	<6.80	<6.60
Arsenic (mg/kg)	<10.0	<10.0	<10.0	<10.0	11	<11.0	<11.0
Barium (mg/kg)	29	22	22	22	<21.0	27	<22.0
Cadmium (mg/kg)	<1.00	<1.00	<1.00	<1.00	<1.00	<1.10	<1.10
Calcium (mg/kg)	3000	3300	3100	3000	3000	3200	2600
Chromium (mg/kg)	32	35	27	29	34	33	29
Cobalt (mg/kg)	<5.00	<5.00	<5.10	<5.10	<5.30	<5.60	<5.50
Copper (mg/kg)	13	10	8.7	7.8	6.1	7.3	<5.50
Iron (mg/kg)	9050	8920	7780	7950	8090	8140	7360
Lead (mg/kg)	23	29	28	13	21	23	9.5
Magnesium (mg/kg)	2600	2300	1900	2000	2100	2100	2000
Manganese (mg/kg)	120	97	140	94	93	99	80
Molybdenum (mg/kg)	<5.00	<5.00	<5.10	<5.10	<5.30	<5.60	<5.50
Nickel (mg/kg)	25	24	22	22	22	23	20
Potassium (mg/kg)	840	940	700	660	620	660	640
Silver (mg/kg)	<5.00	<5.00	<5.10	<5.10	<5.30	<5.60	<5.50
Sodium (mg/kg)	<510	660	<510	<510	<530	<560	<550
Thallium (mg/kg)	<10.0	<10.0	<10.0	<10.0	<10.0	<11.0	<11.0
Titanium (mg/kg)	450	565	390	410	500	510	450
Vanadium (mg/kg)	22	24	21	20	22	21	19
Zinc (mg/kg)	37	35	32	23	26	28	21
Mercury (mg/kg)	NA	NA	NA	NA	NA	NA	NA

Notes: NA = Not Analyzed
 < = Detection Limit
 mg/kg = milligrams per kilogram
 Data not validated by JMM

TABLE 5-7

SITE 1 - 1943-1956 DISPOSAL AREA
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
 (Sheet 3 of 12)

Parameter Reported	B8 05/03/90 0-0 ft	DA-1 05/16/90 0-0.5 ft	DA-1 05/16/90 1.5-2 ft	DA-1 05/16/90 25-25.5 ft	DA-1 05/16/90 50-50.5 ft	DA-1R 05/23/90 0-0.5 ft	DA-2 05/18/90 0-0.5 ft
Aluminum (mg/kg)	4380	7960	13000	39700	5130	11200	5630
Antimony (mg/kg)	<6.20	<6.50	<6.70	<11.0	<7.20	12	<6.40
Arsenic (mg/kg)	<10.0	14	45	49	<12.0	<11.0	<11.0
Barium (mg/kg)	27	82	130	81	<24.0	120	42
Cadmium (mg/kg)	<1.00	<1.10	12	<1.80	<1.20	42	2.1
Calcium (mg/kg)	2800	6500	6000	3800	5600	6400	4500
Chromium (mg/kg)	26	52	77	130	28	430	34
Cobalt (mg/kg)	<5.20	6	10	20	<6.00	72	6
Copper (mg/kg)	7.6	41	280	170	11	170	29
Iron (mg/kg)	7150	15600	47600	50700	8460	17800	9710
Lead (mg/kg)	28	52	200	32	<6.00	1460	64
Magnesium (mg/kg)	2000	4100	6000	11000	2000	4600	2200
Manganese (mg/kg)	84	200	330	370	91	220	130
Molybdenum (mg/kg)	<5.20	<5.40	<5.60	<9.00	<6.00	<5.60	<5.30
Nickel (mg/kg)	20	53	73	140	22	200	25
Potassium (mg/kg)	750	1000	1600	5400	810	1300	880
Silver (mg/kg)	<5.20	<5.40	<5.60	<9.00	<6.00	<5.60	<5.30
Sodium (mg/kg)	<520	<540	<560	9900	980	<560	<530
Thallium (mg/kg)	<10.0	<11.0	<11.0	<18.0	<12.0	<11.0	<11.0
Titanium (mg/kg)	440	530	544	1350	480	430	350
Vanadium (mg/kg)	20	30	44	99	22	31	24
Zinc (mg/kg)	28	110	360	130	22	420	74
Mercury (mg/kg)	NA	<0.220	0.75	<0.360	<0.240	1	<0.210

Notes: NA = Not Analyzed
 < = Detection Limit
 mg/kg = milligrams per kilogram
 Data not validated by JMM

TABLE 5-7

SITE 1 - 1943-1956 DISPOSAL AREA
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
 (Sheet 4 of 12)

Parameter Reported	DA-2 05/18/90 12.5-13 ft	DA-2 05/18/90 25.5-26 ft	DA-2 05/18/90 39.5-40 ft	DA-2R 05/23/90 2-2.5 ft	DAR-1 05/17/90 0-0 ft	DAR-2 05/12/90 0-0 ft	DAR-3 05/12/90 0-0 ft
Aluminum (mg/kg)	27500	4190	9130	8170	10100	4610	7540
Antimony (mg/kg)	<11.0	<7.50	<7.20	<7.20	<6.20	<6.70	<6.30
Arsenic (mg/kg)	19	<12.0	<12.0	<12.0	34	<11.0	<10.0
Barium (mg/kg)	130	<25.0	<24.0	41	83	22	46
Cadmium (mg/kg)	<1.90	<1.20	<1.20	1.4	1.9	<1.10	1.4
Calcium (mg/kg)	5400	2100	2600	5700	5400	2200	2500
Chromium (mg/kg)	86	22	53	41	40	27	54
Cobalt (mg/kg)	15	<6.30	9.4	7.3	7.4	<5.60	<5.30
Copper (mg/kg)	60	6.4	39	32	61	6.7	28
Iron (mg/kg)	33500	6240	17800	14100	17900	7520	12100
Lead (mg/kg)	11	<6.30	<6.00	61	150	22	120
Magnesium (mg/kg)	8200	1700	3300	3400	4700	1600	2800
Manganese (mg/kg)	280	58	240	150	280	71	150
Molybdenum (mg/kg)	<9.40	<6.30	<6.00	<6.00	<5.20	<5.60	<5.30
Nickel (mg/kg)	82	14	59	32	42	22	28
Potassium (mg/kg)	3800	880	830	1300	1300	610	1300
Silver (mg/kg)	<9.40	<6.30	<6.00	<6.00	<5.20	<5.60	<5.30
Sodium (mg/kg)	2000	1700	2000	<600	<520	<560	<530
Thallium (mg/kg)	<19.0	<12.0	<12.0	<12.0	<10.0	<11.0	<10.0
Titanium (mg/kg)	1160	260	692	520	518	390	390
Vanadium (mg/kg)	71	12	36	29	38	19	25
Zinc (mg/kg)	82	16	42	79	140	32	120
Mercury (mg/kg)	<0.370	<0.250	<0.240	<0.240	NA	NA	NA

Notes: NA = Not Analyzed
 < = Detection Limit
 mg/kg = milligrams per kilogram
 Data not validated by JMM

TABLE 5-7

SITE 1 - 1943-1956 DISPOSAL AREA
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
(Sheet 5 of 12)

Parameter Reported	DAR-4 05/12/90 0-0 ft	F1 05/16/90 0-0 ft	F10 05/16/90 0-0 ft	F2 05/03/90 0-0 ft	F3 05/03/90 0-0 ft	F4 05/03/90 0-0 ft	F5 05/03/90 0-0 ft
Aluminum (mg/kg)	4110	8350	5400	7550	4620	4910	4580
Antimony (mg/kg)	<6.20	<6.20	<6.20	<6.20	<7.30	<6.60	<6.30
Arsenic (mg/kg)	<10.0	13	<10.0	<10.0	<12.0	<11.0	<10.0
Barium (mg/kg)	<21.0	260	33	32	<24.0	23	22
Cadmium (mg/kg)	<1.00	1.4	<1.00	<1.00	<1.20	<1.00	<1.00
Calcium (mg/kg)	2400	3400	2700	3600	2300	2200	2300
Chromium (mg/kg)	28	44	34	30	28	29	32
Cobalt (mg/kg)	<5.20	5.8	<5.20	6.1	<6.00	<5.50	<5.30
Copper (mg/kg)	7.8	35	15	18	7.4	6	6
Iron (mg/kg)	7360	13300	9050	13000	7630	7260	7620
Lead (mg/kg)	15	82	20	51	21	10	14
Magnesium (mg/kg)	1800	3100	2100	3400	2000	2100	2100
Manganese (mg/kg)	86	190	110	160	83	69	74
Molybdenum (mg/kg)	<5.20	<5.20	<5.20	<5.10	<6.00	<5.50	<5.30
Nickel (mg/kg)	21	39	25	25	22	21	20
Potassium (mg/kg)	640	1200	810	1200	920	880	780
Silver (mg/kg)	<5.20	<5.20	<5.20	<5.10	<6.00	30	<5.30
Sodium (mg/kg)	<520	<520	<520	<510	<610	<550	<530
Thallium (mg/kg)	<10.0	<10.0	<10.0	<10.0	<12.0	<11.0	<10.0
Titanium (mg/kg)	430	590	518	554	430	470	480
Vanadium (mg/kg)	21	29	24	31	20	18	20
Zinc (mg/kg)	23	120	43	100	40	20	22
Mercury (mg/kg)	NA	NA	NA	NA	NA	NA	NA

Notes: NA = Not Analyzed
< = Detection Limit
mg/kg = milligrams per kilogram
Data not validated by JMM

TABLE 5-7

SITE 1 - 1943-1956 DISPOSAL AREA
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
(Sheet 6 of 12)

Parameter Reported	F6 05/03/90 0-0 ft	F9 05/04/90 0-0 ft	G1 05/03/90 0-0 ft	G10 05/16/90 0-0 ft	G2 05/03/90 0-0 ft	G3 05/03/90 0-0 ft	G4 05/03/90 0-0 ft
Aluminum (mg/kg)	4480	4570	8600	5260	13300	6460	4040
Antimony (mg/kg)	<6.30	<6.00	<6.30	<6.20	<6.10	<6.20	<6.60
Arsenic (mg/kg)	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<11.0
Barium (mg/kg)	25	30	58	210	52	35	<22.0
Cadmium (mg/kg)	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.10
Calcium (mg/kg)	2600	2400	4900	2800	8100	3300	2900
Chromium (mg/kg)	28	30	47	29	24	34	26
Cobalt (mg/kg)	<5.20	<5.00	6.3	<5.20	7.4	<5.20	<5.50
Copper (mg/kg)	7.1	26	27	16	35	20	6.1
Iron (mg/kg)	7910	7710	15000	8530	17300	10400	6900
Lead (mg/kg)	18	17	44	41	34	35	13
Magnesium (mg/kg)	1900	2000	3900	2000	6000	2500	1700
Manganese (mg/kg)	100	92	220	140	330	180	85
Molybdenum (mg/kg)	<5.20	<5.00	<5.20	<5.20	<5.00	<5.20	<5.50
Nickel (mg/kg)	21	22	38	25	32	28	21
Potassium (mg/kg)	620	660	1100	580	960	1000	600
Silver (mg/kg)	<5.20	<5.00	<5.20	<5.20	<5.00	<5.20	<5.50
Sodium (mg/kg)	<520	<500	<520	<520	790	<520	<550
Thallium (mg/kg)	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<11.0
Titanium (mg/kg)	440	390	547	546	550	460	350
Vanadium (mg/kg)	21	20	31	25	48	25	17
Zinc (mg/kg)	27	27	71	56	48	68	21
Mercury (mg/kg)	NA	NA	NA	NA	NA	NA	NA

Notes: NA = Not Analyzed
 < = Detection Limit
 mg/kg = milligrams per kilogram
 Data not validated by JMM

TABLE 5-7

SITE 1 - 1943-1956 DISPOSAL AREA
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
(Sheet 7 of 12)

Parameter Reported	G5 05/03/90 0-0 ft	G8 05/04/90 0-0 ft	G9 05/16/90 0-0 ft	H1 05/04/90 0-0 ft	H2 05/04/90 0-0 ft	H3 05/04/90 0-0 ft	H4 05/04/90 0-0 ft
Aluminum (mg/kg)	5580	4230	4960	8560	7880	12600	4560
Antimony (mg/kg)	<7.00	<6.70	<6.20	<6.10	<6.40	<6.10	<6.70
Arsenic (mg/kg)	<12.0	<11.0	11	<10.0	<11.0	25	<11.0
Barium (mg/kg)	43	<22.0	27	910	60	83	24
Cadmium (mg/kg)	<1.20	<1.10	<1.00	2	1.5	4.1	<1.10
Calcium (mg/kg)	2800	2300	4200	7500	3300	5700	2800
Chromium (mg/kg)	31	26	31	44	41	74	29
Cobalt (mg/kg)	<5.90	<5.60	<5.20	6.8	6.1	10	<5.60
Copper (mg/kg)	8.7	<5.60	14	49	24	71	7.3
Iron (mg/kg)	9460	7500	9070	14800	13400	32600	7920
Lead (mg/kg)	19	6.7	12	85	59	320	16
Magnesium (mg/kg)	2900	1800	1800	4000	4200	6500	1900
Manganese (mg/kg)	98	69	100	300	260	1230	99
Molybdenum (mg/kg)	<5.90	<5.60	<5.20	<5.00	<5.40	<5.10	<5.60
Nickel (mg/kg)	28	22	25	36	40	32	24
Potassium (mg/kg)	1400	860	860	1100	1500	1100	970
Silver (mg/kg)	<5.90	<5.60	<5.20	<5.00	<5.40	<5.10	<5.60
Sodium (mg/kg)	<590	<560	<520	<510	<540	<510	<560
Thallium (mg/kg)	<12.0	<11.0	<10.0	<10.0	<11.0	14	<11.0
Titanium (mg/kg)	500	370	500	831	440	510	340
Vanadium (mg/kg)	21	17	23	32	26	50	19
Zinc (mg/kg)	30	17	29	260	88	220	23
Mercury (mg/kg)	NA	NA	NA	NA	NA	NA	NA

Notes: NA = Not Analyzed

< = Detection Limit

mg/kg = milligrams per kilogram

Data not validated by JMM

TABLE 5-7

SITE 1 - 1943-1956 DISPOSAL AREA
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
(Sheet 8 of 12)

Parameter Reported	H8 05/04/90 0-0 ft	H9 05/16/90 0-0 ft	I2 05/04/90 0-0 ft	I3 05/04/90 0-0 ft	I4 05/04/90 0-0 ft	I8 05/16/90 0-0 ft	J1 05/04/90 0-0 ft
Aluminum (mg/kg)	4440	8870	5880	6970	6030	5520	5770
Antimony (mg/kg)	<6.40	<6.90	<6.20	<6.00	<6.00	<6.50	<6.00
Arsenic (mg/kg)	<11.0	21	<10.0	<10.0	<10.0	11	<10.0
Barium (mg/kg)	<21.0	71	43	32	29	37	45
Cadmium (mg/kg)	<1.00	<1.10	1.2	<1.00	<1.00	<1.00	3.7
Calcium (mg/kg)	2500	2500	2500	2900	2400	2400	3100
Chromium (mg/kg)	26	42	56	32	31	32	46
Cobalt (mg/kg)	<5.40	7.7	<5.10	<5.00	<5.00	<5.40	<5.00
Copper (mg/kg)	7.3	18	23	20	11	16	140
Iron (mg/kg)	7410	14800	10600	10100	9770	9530	12700
Lead (mg/kg)	13	8.7	160	23	27	10	160
Magnesium (mg/kg)	1800	3500	2600	2500	2400	2300	2400
Manganese (mg/kg)	66	250	150	120	100	140	210
Molybdenum (mg/kg)	<5.40	<5.70	<5.10	<5.00	<5.00	<5.40	<5.00
Nickel (mg/kg)	22	44	25	24	24	28	35
Potassium (mg/kg)	740	1400	1200	1100	750	960	920
Silver (mg/kg)	<5.40	<5.70	<5.10	<5.00	<5.00	<5.40	<5.00
Sodium (mg/kg)	<540	<570	<510	<510	<510	<540	<510
Thallium (mg/kg)	<11.0	<11.0	<10.0	<10.0	<10.0	<11.0	<10.0
Titanium (mg/kg)	350	534	310	527	430	490	290
Vanadium (mg/kg)	17	30	19	24	24	22	20
Zinc (mg/kg)	19	34	250	36	37	28	200
Mercury (mg/kg)	NA	NA	NA	NA	NA	NA	NA

Notes: NA = Not Analyzed
< = Detection Limit
mg/kg = milligrams per kilogram
Data not validated by JMM

TABLE 5-7

SITE 1 - 1943-1956 DISPOSAL AREA
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
(Sheet 9 of 12)

Parameter Reported	J2 05/04/90 0-0 ft	J3 05/04/90 0-0 ft	J7 05/04/90 0-0 ft	J8 05/16/90 0-0 ft	K0 05/16/90 0-0 ft	K1 05/16/90 0-0 ft	K2 05/04/90 0-0 ft
Aluminum (mg/kg)	6110	4790	5880	3830	4620	5540	6870
Antimony (mg/kg)	<6.00	<6.00	<6.60	<6.20	<6.20	<6.20	<6.00
Arsenic (mg/kg)	<10.0	<10.0	<11.0	11	<10.0	10	<10.0
Barium (mg/kg)	48	28	27	<21.0	<21.0	40	52
Cadmium (mg/kg)	2.1	<1.00	<1.00	<1.00	<1.00	<1.00	7.8
Calcium (mg/kg)	2500	1800	2200	2800	5400	2800	2400
Chromium (mg/kg)	37	28	30	25	31	28	55
Cobalt (mg/kg)	<5.00	<5.00	<5.50	<5.20	<5.20	<5.10	6.3
Copper (mg/kg)	71	29	13	9.4	21	20	66
Iron (mg/kg)	12000	8880	9150	7560	9710	10000	12700
Lead (mg/kg)	130	39	23	13	130	54	200
Magnesium (mg/kg)	2700	2300	2200	1600	2200	2100	3400
Manganese (mg/kg)	160	71	83	110	130	130	220
Molybdenum (mg/kg)	<5.00	<5.00	<5.50	<5.20	<5.20	<5.10	<5.00
Nickel (mg/kg)	26	23	26	23	28	22	47
Potassium (mg/kg)	830	590	850	650	720	690	950
Silver (mg/kg)	<5.00	<5.00	<5.50	<5.20	<5.20	<5.10	<5.00
Sodium (mg/kg)	<500	<510	<550	<520	<520	<510	<510
Thallium (mg/kg)	<10.0	<10.0	<11.0	<10.0	<10.0	<10.0	<10.0
Titanium (mg/kg)	380	330	370	280	380	420	310
Vanadium (mg/kg)	25	19	23	19	20	22	22
Zinc (mg/kg)	514	52	33	24	57	89	110
Mercury (mg/kg)	NA	NA	NA	NA	NA	NA	NA

Notes: NA = Not Analyzed
 < = Detection Limit
 mg/kg = milligrams per kilogram
 Data not validated by JMM

TABLE 5-7

SITE 1 - 1943-1956 DISPOSAL AREA
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
 (Sheet 10 of 12)

Parameter Reported	K6 05/04/90 0-0 ft	K7 05/16/90 0-0 ft	L0 05/16/90 0-0 ft	L1 05/04/90 0-0 ft	L2 05/04/90 0-0 ft	L5 05/04/90 0-0 ft	L6 05/16/90 0-0 ft
Aluminum (mg/kg)	7760	4660	7540	6520	5860	7690	5210
Antimony (mg/kg)	<6.40	<6.20	<6.20	6.4	<6.10	<6.40	<6.20
Arsenic (mg/kg)	<11.0	11	12	<10.0	<10.0	<11.0	<10.0
Barium (mg/kg)	41	<21.0	110	130	40	45	30
Cadmium (mg/kg)	<1.00	<1.00	1	7	5.3	<1.00	<1.00
Calcium (mg/kg)	4100	2500	4400	3000	2700	3700	5800
Chromium (mg/kg)	35	28	43	51	38	35	32
Cobalt (mg/kg)	5.4	<5.20	5.4	6.5	<5.00	5.3	<5.10
Copper (mg/kg)	20	7.4	34	120	55	21	11
Iron (mg/kg)	13400	8390	13400	14700	10600	12400	8870
Lead (mg/kg)	32	12	62	240	96	49	12
Magnesium (mg/kg)	3200	1700	3100	3900	2400	3300	1600
Manganese (mg/kg)	130	99	180	240	110	150	90
Molybdenum (mg/kg)	<5.40	<5.20	<5.20	<5.00	<5.00	<5.30	<5.10
Nickel (mg/kg)	34	25	32	55	32	32	23
Potassium (mg/kg)	1500	880	1000	980	760	1200	720
Silver (mg/kg)	<5.40	<5.20	<5.20	<5.00	<5.00	<5.30	<5.10
Sodium (mg/kg)	<540	<520	<520	<500	<510	<530	<510
Thallium (mg/kg)	<11.0	<10.0	<10.0	<10.0	<10.0	<11.0	<10.0
Titanium (mg/kg)	360	470	579	320	360	370	400
Vanadium (mg/kg)	27	23	29	73	24	27	22
Zinc (mg/kg)	48	29	80	518	140	64	30
Mercury (mg/kg)	NA	NA	NA	NA	NA	NA	NA

Notes: NA = Not Analyzed
 < = Detection Limit
 mg/kg = milligrams per kilogram
 Data not validated by JMM

TABLE 5-7

SITE 1 - 1943-1956 DISPOSAL AREA
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
(Sheet 11 of 12)

Parameter Reported	L7 05/16/90 0-0 ft	M0 05/04/90 0-0 ft	M1 05/04/90 0-0 ft	M10 05/16/90 0-0 ft	M4 05/16/90 0-0 ft	M5 05/04/90 0-0 ft	M6 05/16/90 0-0 ft
Aluminum (mg/kg)	4550	7190	8100	12900	5810	9080	11900
Antimony (mg/kg)	<6.20	<6.00	<6.00	<6.30	<6.00	<6.10	<6.20
Arsenic (mg/kg)	11	12	<10.0	21	<10.0	22	28
Barium (mg/kg)	21	130	61	47	52	81	74
Cadmium (mg/kg)	<1.00	<1.00	5.3	12	1.1	2.3	1.2
Calcium (mg/kg)	2100	4800	3500	6300	2700	5700	4700
Chromium (mg/kg)	31	90	52	36	35	34	46
Cobalt (mg/kg)	<5.10	6.8	6.1	9.5	5.1	6.4	9.6
Copper (mg/kg)	12	220	100	54	23	47	49
Iron (mg/kg)	8620	16800	14800	22900	10900	16200	20400
Lead (mg/kg)	23	64	170	160	80	180	97
Magnesium (mg/kg)	1700	5100	3500	4400	2700	4500	5900
Manganese (mg/kg)	88	190	190	370	150	260	310
Molybdenum (mg/kg)	<5.10	25	<5.00	<5.20	<5.00	<5.00	<5.20
Nickel (mg/kg)	28	86	39	30	33	38	52
Potassium (mg/kg)	640	920	1200	690	840	1300	1500
Silver (mg/kg)	<5.10	<5.00	<5.00	<5.20	<5.00	<5.00	<5.20
Sodium (mg/kg)	<510	<510	<500	<520	<500	<510	<520
Thallium (mg/kg)	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
Titanium (mg/kg)	400	510	430	731	350	430	663
Vanadium (mg/kg)	24	26	29	66	27	38	46
Zinc (mg/kg)	34	130	160	100	95	140	110
Mercury (mg/kg)	NA	NA	NA	NA	NA	NA	NA

Notes: NA = Not Analyzed
 < = Detection Limit
 mg/kg = milligrams per kilogram
 Data not validated by JMM

TABLE 5-7

SITE 1 - 1943-1956 DISPOSAL AREA
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
(Sheet 12 of 12)

Parameter Reported	M7 05/16/90 0-0 ft	M8 05/16/90 0-0 ft	M9 05/16/90 0-0 ft	N0 05/04/90 0-0 ft	O0 05/04/90 0-0 ft
Aluminum (mg/kg)	12600	8740	7460	10200	11500
Antimony (mg/kg)	<6.20	<6.20	<6.20	<6.20	<6.20
Arsenic (mg/kg)	33	19	18	12	<10.0
Barium (mg/kg)	73	49	47	120	93
Cadmium (mg/kg)	1.7	1	1.2	13	5.4
Calcium (mg/kg)	6600	4500	4000	9100	6400
Chromium (mg/kg)	38	43	34	64	48
Cobalt (mg/kg)	7.9	6.2	5.4	8.2	7.4
Copper (mg/kg)	49	33	37	150	68
Iron (mg/kg)	20800	14600	12000	22100	17600
Lead (mg/kg)	170	60	69	440	100
Magnesium (mg/kg)	5300	3500	2700	4200	4500
Manganese (mg/kg)	320	200	170	350	310
Molybdenum (mg/kg)	<5.20	<5.20	<5.20	<5.10	<5.20
Nickel (mg/kg)	38	36	31	56	44
Potassium (mg/kg)	1700	1300	940	1300	1600
Silver (mg/kg)	<5.20	<5.20	<5.20	<5.10	<5.20
Sodium (mg/kg)	<520	<520	<520	<510	580
Thallium (mg/kg)	<10.0	<10.0	<10.0	<10.0	<10.0
Titanium (mg/kg)	604	510	480	490	480
Vanadium (mg/kg)	50	33	34	34	34
Zinc (mg/kg)	130	81	77	330	160
Mercury (mg/kg)	NA	NA	NA	NA	NA

Notes: NA = Not Analyzed
 < = Detection Limit
 mg/kg = milligrams per kilogram
 Data not validated by JMM

TABLE 5-8
SITE 1 - 1943-1956 DISPOSAL AREA
RESULTS FOR RADIONUCLIDES DETECTED IN SOIL SAMPLES
(Sheet 1 of 4)

Parameter Reported	A1 05/03/90 0-0 ft	A2 05/03/90 0-0 ft	A3 05/03/90 0-0 ft	A4 05/03/90 0-0 ft	A5 05/03/90 0-0 ft	A6 05/03/90 0-0 ft	A7 05/03/90 0-0 ft
Gross Alpha (pCi/g)	5.5	1.7	4.9	4.4	2.3	2.3	12
Gross Beta (pCi/g)	9.8	8.7	11	20	14	8.5	11
Radium 226 (pCi/g)	0.3	0.2	0.1	0.3	0.1	0.3	1
Radium 228 (pCi/g)	0.2	<0.000	1.1	0.5	<0.000	<0.000	1.5
Parameter Reported	A8 05/03/90 0-0 ft	B2 05/03/90 0-0 ft	B3 05/03/90 0-0 ft	B4 05/03/90 0-0 ft	B5 05/03/90 0-0 ft	B6 05/03/90 0-0 ft	B7 05/03/90 0-0 ft
Gross Alpha (pCi/g)	3.3	7	4.4	4.4	1.7	2.8	2.3
Gross Beta (pCi/g)	13	9.2	13	11	11	9.7	9.4
Radium 226 (pCi/g)	0.5	0.1	0.7	0.1	0.7	0.1	<0.000
Radium 228 (pCi/g)	0.4	<0.000	<0.000	<0.000	<0.000	2.3	<0.000
Parameter Reported	B8 05/03/90 0-0 ft	DA-1 05/16/90 0.5-1 ft	DA-1 05/16/90 1.5-2 ft	DA-1 05/16/90 25.5-26 ft	DA-1 05/16/90 50-50.5 ft	DA-1R 05/23/90 0.5-1 ft	DA-2 05/18/90 0.5-1 ft
Gross Alpha (pCi/g)	2	3.4	1.2	1.7	2.3	2.3	20
Gross Beta (pCi/g)	11	14	12	17	8.8	8	18
Radium 226 (pCi/g)	0.3	0.4	0.4	0.5	0.3	<0.000	0.2
Radium 228 (pCi/g)	<0.000	<0.000	<0.000	<0.000	5.4	1.1	<0.000

Notes: NA = Not Analyzed
< = Detection Limit
pCi/g = picocuries per gram
Data not validated by JMM

TABLE 5-8

SITE 1 - 1943-1956 DISPOSAL AREA
RESULTS FOR RADIONUCLIDES DETECTED IN SOIL SAMPLES
(Sheet 2 of 4)

Parameter Reported	DA-2 05/18/90 13-13.5 ft	DA-2 05/18/90 26-26.5 ft	DA-2 05/18/90 40-40.5 ft	DA-2R 05/23/90 2.5-3 ft	DAR-1 05/17/90 0-0 ft	DAR-2 05/12/90 0-0 ft	DAR-3 05/12/90 0-0 ft
Gross Alpha (pCi/g)	7.4	34	52	5	15	14	21
Gross Beta (pCi/g)	9.8	11	0.9	12	16	7.8	13
Radium 226 (pCi/g)	0.3	0.5	0.3	0.7	0.1	1.2	0.4
Radium 228 (pCi/g)	<0.000	0.3	1.2	0.5	<0.000	<0.000	0.9
Parameter Reported	DAR-4 05/12/90 0-0 ft	F1 05/16/90 0-0 ft	F10 05/16/90 0-0 ft	F2 05/03/90 0-0 ft	F3 05/03/90 0-0 ft	F4 05/03/90 0-0 ft	F5 05/03/90 0-0 ft
Gross Alpha (pCi/g)	16	2	2.3	2.2	2.3	3.9	4.9
Gross Beta (pCi/g)	29	14	15	11	11	10	8.6
Radium 226 (pCi/g)	0.4	0.1	0.4	<0.000	<0.000	0.1	0.4
Radium 228 (pCi/g)	0.5	<0.000	2.3	1.5	1.2	0.8	1.2
Parameter Reported	F6 05/03/90 0-0 ft	F9 05/04/90 0-0 ft	G1 05/03/90 0-0 ft	G10 05/16/90 0-0 ft	G2 05/03/90 0-0 ft	G3 05/03/90 0-0 ft	G4 05/03/90 0-0 ft
Gross Alpha (pCi/g)	2.8	3.9	3.4	2.3	1.8	1.7	1.2
Gross Beta (pCi/g)	14	12	12	18	2.8	19	10
Radium 226 (pCi/g)	<0.000	<0.000	0.2	0.7	0.1	1.4	0.3
Radium 228 (pCi/g)	1.7	0.8	4.1	<0.000	1.9	0.2	1.9

Notes: NA = Not Analyzed
 < = Detection Limit
 pCi/g = picocuries per gram
 Data not validated by JMM

TABLE 5-8

SITE 1 - 1943-1956 DISPOSAL AREA
RESULTS FOR RADIONUCLIDES DETECTED IN SOIL SAMPLES
(Sheet 3 of 4)

Parameter Reported	G5 05/03/90 0-0 ft	G8 05/04/90 0-0 ft	G9 05/16/90 0-0 ft	H1 05/04/90 0-0 ft	H2 05/04/90 0-0 ft	H3 05/04/90 0-0 ft	H4 05/04/90 0-0 ft
Gross Alpha (pCi/g)	2.3	8.2	6.1	7.5	7.5	5.8	1.8
Gross Beta (pCi/g)	8.5	6.4	12	11	11	15	11
Radium 226 (pCi/g)	0.3	0.1	0.4	0.7	0.4	<0.000	0.1
Radium 228 (pCi/g)	0.7	<0.000	2.6	1	0.9	<0.000	0.7
Parameter Reported	H8 05/04/90 0-0 ft	H9 05/16/90 0-0 ft	I2 05/04/90 0-0 ft	I3 05/04/90 0-0 ft	I4 05/04/90 0-0 ft	I7 05/04/90 0-0 ft	I8 05/16/90 0-0 ft
Gross Alpha (pCi/g)	0.7	2.3	4.1	3	4.1	2.8	2.3
Gross Beta (pCi/g)	10	5.3	19	15	16	12	17
Radium 226 (pCi/g)	<0.000	0.3	0.1	0.5	0.1	<0.000	1
Radium 228 (pCi/g)	0.9	0.3	0.1	1	0.9	0.9	<0.000
Parameter Reported	J1 05/04/90 0-0 ft	J2 05/04/90 0-0 ft	J3 05/04/90 0-0 ft	J7 05/04/90 0-0 ft	J8 05/16/90 0-0 ft	K0 05/16/90 0-0 ft	K1 05/16/90 0-0 ft
Gross Alpha (pCi/g)	2.4	7	<0.000	0.9	1.2	2.3	1.2
Gross Beta (pCi/g)	18	7.5	16	12	13	11	12
Radium 226 (pCi/g)	0.7	0.5	0.5	0.1	0.6	0.6	0.3
Radium 228 (pCi/g)	0.8	1.2	0.5	1.2	<0.000	0.1	0.6

Notes: NA = Not Analyzed
< = Detection Limit
pCi/g = picocuries per gram
Data not validated by JMM

TABLE 5-8

SITE 1 - 1943-1956 DISPOSAL AREA
RESULTS FOR RADIONUCLIDES DETECTED IN SOIL SAMPLES
(Sheet 4 of 4)

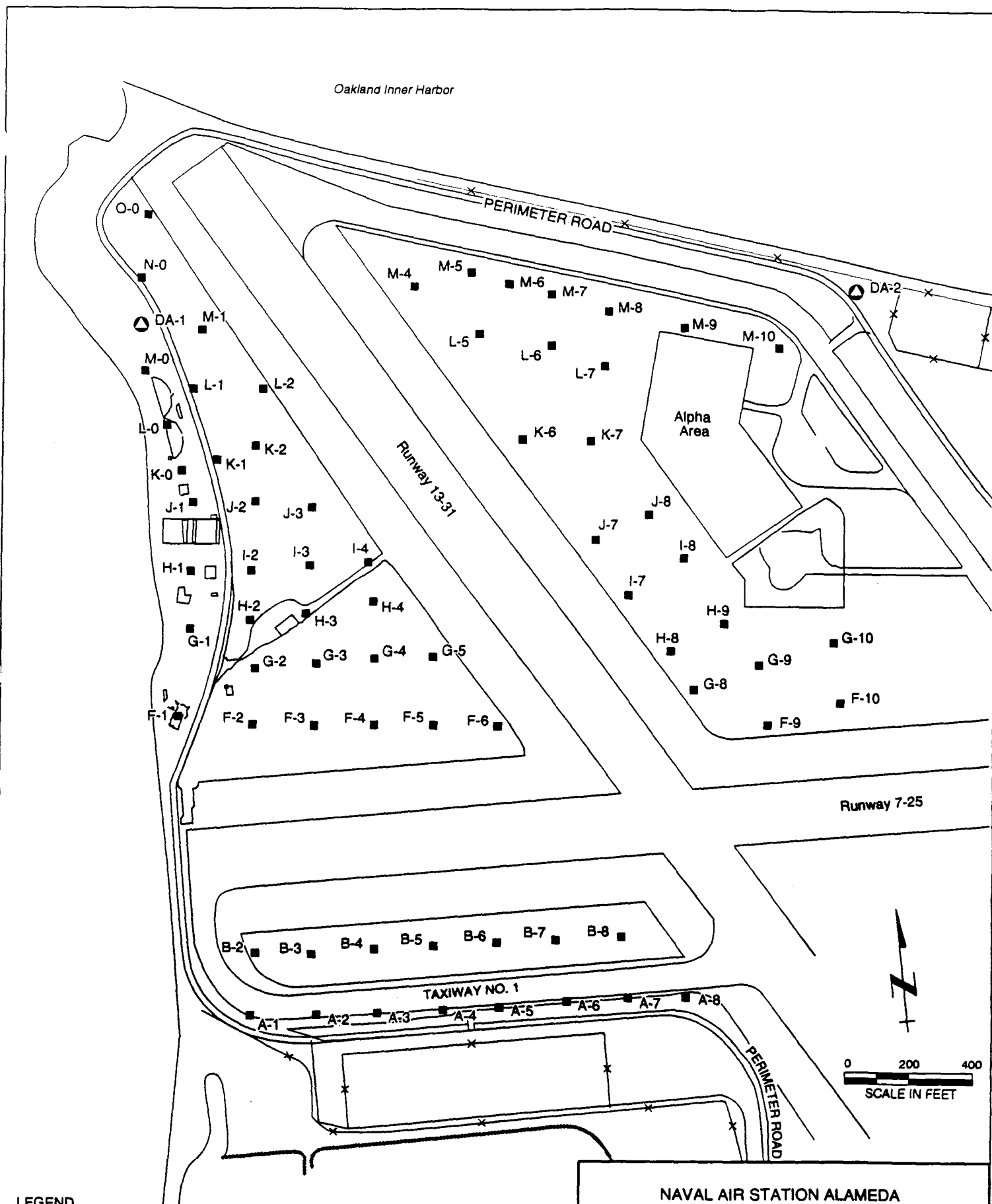
Parameter Reported	K2 05/04/90 0-0 ft	K6 05/04/90 0-0 ft	K7 05/16/90 0-0 ft	L0 05/16/90 0-0 ft	L1 05/04/90 0-0 ft	L2 05/04/90 0-0 ft	L5 05/04/90 0-0 ft
Gross Alpha (pCi/g)	4.6	6.6	<0.000	0.1	5.5	3.4	5.5
Gross Beta (pCi/g)	9.8	12	13	9.3	11	11	11
Radium 226 (pCi/g)	0.3	0.1	0.3	0.1	<0.000	0.5	<0.000
Radium 228 (pCi/g)	1.3	1.6	<0.000	<0.000	0.4	<0.000	0.6
Parameter Reported	L6 05/16/90 0-0 ft	L7 05/16/90 0-0 ft	M0 05/04/90 0-0 ft	M1 05/04/90 0-0 ft	M10 05/16/90 0-0 ft	M4 05/16/90 0-0 ft	M5 05/04/90 0-0 ft
Gross Alpha (pCi/g)	1.2	2.8	3.3	5.5	3.1	5.5	4.5
Gross Beta (pCi/g)	4.6	6	15	7.1	3.8	12	11
Radium 226 (pCi/g)	0.4	0.3	0.8	0.3	0.1	0.1	<0.000
Radium 228 (pCi/g)	1	<0.000	0.9	0.3	0.4	1	<0.000
Parameter Reported	M6 05/16/90 0-0 ft	M7 05/16/90 0-0 ft	M8 05/16/90 0-0 ft	M9 05/16/90 0-0 ft	N0 05/04/90 0-0 ft	O0 05/04/90 0-0 ft	
Gross Alpha (pCi/g)	2.8	2.8	3.4	2.8	1.7	5.6	
Gross Beta (pCi/g)	16	8.7	9.1	6.9	14	10	
Radium 226 (pCi/g)	2.2	0.9	0.4	0.6	<0.000	0.3	
Radium 228 (pCi/g)	1.4	3.2	3.2	<0.000	0.7	0.6	

Notes: NA = Not Analyzed

< = Detection Limit

pCi/g = picocuries per gram

Data not validated by JMM



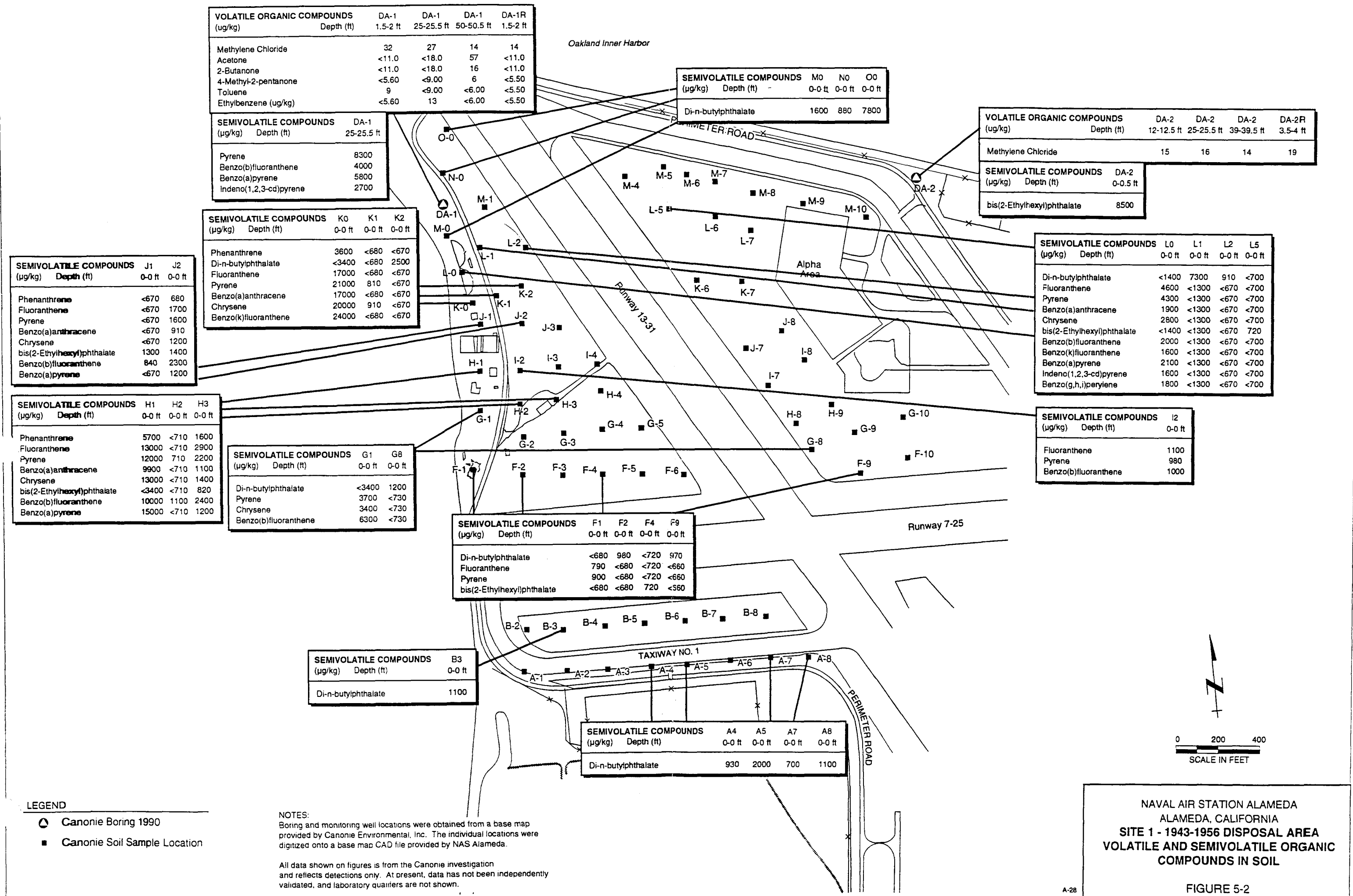
LEGEND

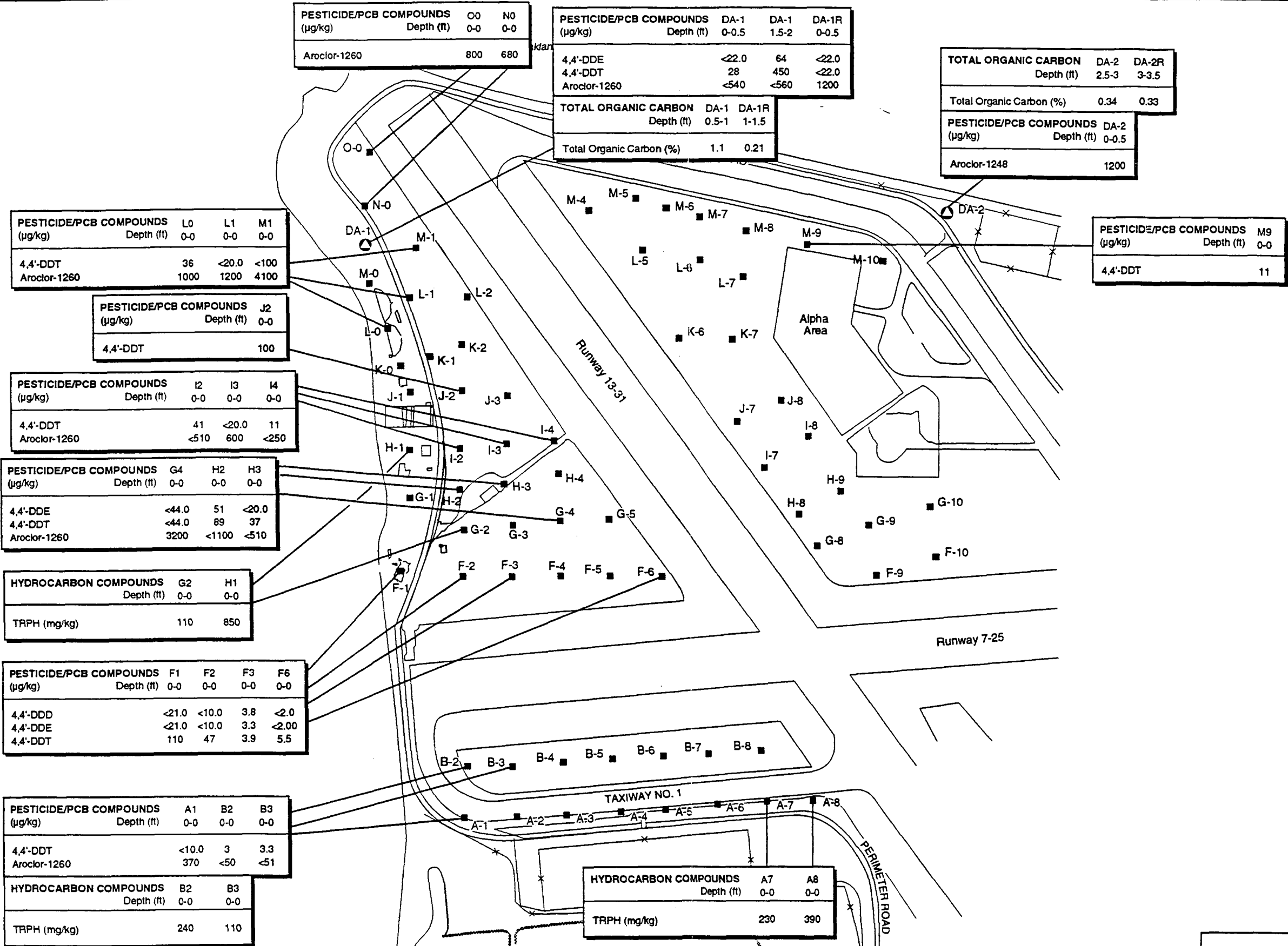
- Canobie Boring 1990
- Canobie Soil Sample Location

NOTE: Boring and monitoring well locations were obtained from a base map provided by Canobie Environmental, Inc. The individual locations were digitized onto a base map CAD file provided by NAS Alameda.

NAVAL AIR STATION ALAMEDA ALAMEDA, CALIFORNIA SITE 1 - 1943-1956 DISPOSAL AREA CANOBIE BORING AND SURFACE SAMPLING LOCATIONS

FIGURE 5-1





LEGEND

- Canonie Boring 1990
- Canonie Soil Sample Location

NOTES:

Boring and monitoring well locations were obtained from a base map provided by Canonie Environmental, Inc. The individual locations were digitized onto a base map CAD file provided by NAS Alameda.

All data shown on figures is from the Canonie investigation and reflects detections only. At present, data has not been independently validated, and laboratory qualifiers are not shown.

NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
SITE 1 - 1943-1956 DISPOSAL AREA
PESTICIDES AND PCB COMPOUNDS, TRPH,
AND TOTAL ORGANIC CARBON
IN SOIL

FIGURE 5-3

6.0 SITE 2 - WEST BEACH LANDFILL

6.1 INTRODUCTION

This section summarizes the preliminary phase of the field investigation conducted at Site 2 by Canonie in 1990 as part of the SWAT investigation mandated by the RWQCB in June 1987. A second, and more extensive, phase of the field investigation for the SWAT report was subsequently conducted in 1991 by the PRC team, which included Sites 1 and 2. The data from the second phase were presented in a SWAT report prepared by the PRC team and submitted to the DTSC in September 1992.

The initial intent was to include the data obtained in the Canonie investigation in the SWAT report. Because the Canonie analytical data were not available at the time the SWAT report was completed, only subsurface geologic data generated at this site by the Canonie investigation were incorporated in the SWAT report. This section presents only the results of the chemical analyses performed by Canonie. A comprehensive presentation of the history of fill and disposal operations, geologic and hydrogeologic conditions, and tidal influences, is discussed in the PRC team's report titled "Solid Waste Water Quality Assessment Test (SWAT) Report, RI/FS Phases 5 and 6, Draft Final," dated September 1992 (PRC/Montgomery Watson, 1993c).

6.2 SITE DESCRIPTION AND BACKGROUND

Site 2, the West Beach Landfill (Initial Assessment Study Site 1) occupies approximately 110 acres in the southwestern corner of NAS Alameda and is located to the south of Site 1 (the 1943-1956 Disposal Area) (Figure 1-2). The western and southern borders of Site 2 are on San Francisco Bay (Figure 6-1). The southwest portion of Site 2 (approximately 42 acres) is within the City and County of San Francisco. The remainder of Site 2 is located in the City and County of Alameda.

Fill operations for the area occupied by Site 2 began in 1956 with the construction of a sea wall along the southern and western sides (Cristi, 1973). USCGS nautical charts dating from 1937 and 1942 indicate the Site 2 area was covered by 3 to 24 feet of seawater prior to the emplacement of fill. By May 1957, the sea wall had been completed and the northern portion of the site had been filled to above sea level. An aerial photo from Pacific Aerial Surveys dated May 19, 1969 shows that the southern portion of the southern half of Site 2 had been filled to above sea level but the northern portion of the southern half remained covered with water. By April 1973, artificial fill had been emplaced over the entire area that is now Site 2.

Disposal operations began at the West Beach Landfill in the early 1950s but full operations began in 1956, following the closure of the 1943-1956 Disposal Area, and continued until 1978 (Canonie, 1990d). The disposal method consisted of excavating a trench to approximately 20 feet bgs in the hydraulic fill and placing the waste material in the trench. The wastes were spread and compacted by a bulldozer and were intermittently covered with excavated soil (E&E, 1983). During the late 1970s, the primary disposal method changed to excavating to the water table and then filling with waste (HLA, 1983).

Known materials that were deposited in Site 2 include waste chemical drums; municipal garbage; solvents; oily waste and sludges; paint waste; plating wastes; industrial strippers and cleaners; acids; mercury; PCB-contaminated fluids and TAC rags; batteries; low-level radiological wastes; scrap metal; inert ordnance; spoiled food; asbestos; pesticides, both solids and liquids; tear gas agent ortho-chlorobenzylidene malononitrile (CS); infectious waste; creosote; dredge spoils; and waste medicines and reagents. An estimated 1.6 million tons of wastes were disposed in the West Beach Landfill (E&E, 1983). According to E&E (1983) and Canonie (1990d) reports, disposal of hazardous materials was discontinued by the early 1970s.

6.3 CURRENT USE

Site 2 is bounded on the west and south by San Francisco Bay, and to the north and east the site is fenced with lockable gates from Perimeter Road and the Runway Area (Figure 6-1). The landfill is surrounded by an earthen berm approximately 55 feet wide and 7 feet high. Several piles of construction debris are present in the southeastern portion of the site. The refuse disposal area is moderately to well vegetated with grasses and supports a variety of wildlife. The wetland area in the southwest corner provides a nesting area for birds and is also well vegetated with grasses. Site 2 is not used for air station operations or activities.

6.4 PREVIOUS INVESTIGATIONS

After disposal activities ceased in March 1978, the Navy developed plans to close the landfill as a Class II landfill in accordance with local and state regulations. Closure plans were submitted to the California Department of Health Services (DHS). Various investigations have been conducted by Navy contractors. A brief synopsis of investigations and events related to landfill closure is presented below (Canonie, 1990d):

- March 1978 - Harding Lawson Associates (HLA) submitted the Sanitary Landfill Site Study (HLA, 1978) to bring Site 2 to closure as a Class II landfill facility to the DHS for review.
- June 1980 - The California Regional Water Quality Control Board-San Francisco Region (RWQCB) received the Draft Sanitary Landfill Closure Plan (HLA, 1980a) for review.

- April 1983 - E&E submitted the Initial Assessment Study report to the Navy. This report presented the results of the first phase of the Navy Assessment and Control of Installation Pollutants (NACIP) program and included the West Beach Landfill as one of 12 sites that had been initially assessed at NAS Alameda.
- September 9, 1983 - The RWQCB issued a Tentative Order of Closure Requirements for the West Beach Landfill. This Tentative Order was followed by Order No. 83-35 on September 28, 1983.
- October 1983 - HLA submitted the second phase of the NACIP investigation known as the Confirmation Study to the RWQCB (HLA, 1983).
- June 1985 - The Navy notified the RWQCB that the slurry wall requested in 1983 had been installed along a portion of the western perimeter of the landfill to prevent seepage of leachate into the bay and that sea wall repairs had been completed in October 1984.
- November 1985 - The Navy informed the RWQCB that the southwestern portion of Site 2, where landfill cover material was being obtained, had been declared a wetland and could no longer be dredged for borrow material for the landfill cover.
- March 1986 - The RWQCB received as-built drawings of the Solid Waste Disposal System prepared by HLA.
- April 1986 - The Navy informed the RWQCB that approximately 75,000 cubic yards of additional material would be necessary to bring the cover thickness up to the original specifications. A contractor had located a source and was spreading 20,000 cubic yards of imported material on the landfill.
- June 1986 - The Navy received a request from the RWQCB for a proposal to address the ponding of water at Site 2. In November 1986, the Navy submitted a plan to the RWQCB for grading the site to prevent ponding of water. The grading was completed in December 1986.
- 1987 and 1988 - The Navy sent requests to the RWQCB to deposit dredge spoils from projects in the vicinity of the air station for cover material in Site 2 if possible. Due to funding and scheduling problems of the dredging projects, no dredge spoils have been deposited at Site 2.
- June 1987 - The Navy was notified by the RWQCB of the requirement to perform a SWAT investigation at Sites 1 and 2.
- 1990 - Canonic drilled four borings, one at each corner of the landfill, to depths between 47 and 90 feet bgs as the initial phase of the SWAT investigation.
- 1992 - The PRC team conducted the final phase of the SWAT investigation and submitted the Final SWAT and DSR to the regulatory agencies in April 1993.

6.5 CANONIC INVESTIGATION

During the initial phase of the SWAT investigation, Canonic drilled four exploratory borings, one at each corner of the West Beach Landfill (Figure 6-1). The borings were drilled to evaluate the vertical extent and composition of the late Pleistocene/Holocene alluvial/eolian deposits prior to installation of a deep

monitoring well network around the landfill. Each boring was drilled approximately 5 feet into the late Pleistocene estuarine deposits to the following depths bgs: WB-1 - 90 feet; WB-2 - 17.5 feet; WB-2B - 63 feet; WB-3 - 46.5 feet; and WB-4 - 51.5 feet. Boring WB-2B was a continuation of Boring WB-2, using a rotary drilling method. A total of 63 soil samples was collected from the four borings and submitted for chemical and geotechnical analyses. Table 6-1 summarizes the analyses performed on the soil samples. Geotechnical data are presented in Table 6-2 and Appendix D. Boring logs are presented in Appendix C. No monitoring wells were constructed nor were groundwater samples collected as part of this phase of the SWAT investigation.

6.5.1 Site Geology/Hydrogeology

This section presents the geologic/hydrogeologic data generated from the four exploratory borings. A comprehensive discussion of subsurface geologic/hydrogeologic conditions is described in the SWAT report (PRC/Montgomery Watson, 1993d).

Artificial fill was encountered in the exploratory borings to depths between 30 and 44 feet bgs. The fill consists predominantly of silty sand or silty fine sand with minor amounts of clay and gravel.

Holocene Bay Mud deposits underlie the artificial fill and consist of black to dark gray clay to silty clay with silty and lesser amounts of clayey sand and sand. The Holocene Bay Mud Unit varies in thickness from 7 to 40 feet in the four borings. In the southwest corner of Site 2 the Bay Mud Unit is silty sand with little or no clay.

As previously mentioned, it is difficult to distinguish between alluvial and eolian (Merritt Sand) deposits underlying the Bay Mud in the vicinity of Sites 1 and 2. Therefore, the sediments underlying the Bay Mud and overlying the late Pleistocene estuarine deposits are referred to as the late Pleistocene/Holocene alluvial/eolian deposits; in the four borings drilled at Site 2, these deposits varied in thickness from 32 to 48 feet. They consist predominantly of silty sand and clayey sand.

The four borings at Site 2 were terminated in the late Pleistocene estuarine deposits. These deposits consisted of dark greenish-gray to gray, very stiff, organic, silty clay.

Groundwater monitoring wells were not installed, so hydraulic gradients were not determined at that time. A complete discussion of the subsurface hydrogeologic conditions is presented in the 1992 SWAT report prepared by the PRC team (PRC/Montgomery Watson, 1993c).

6.5.2 Analytical Results - Soil Samples

A total of 63 soil samples were collected; 55 field samples and 8 replicate samples. The 55 soil samples collected from the four Canonic borings at Site 2 were selectively submitted for VOCs, SVOCs, pesticides/PCBs, metals, general chemical characteristics, radionuclides, and asbestos. Table 6-1 presents a complete listing of the analysis performed on each soil sample.

6.5.2.1 Volatile Organic Compounds. Three VOCs were detected in 14 soil samples: acetone, 2-butanone, and methylene chloride. Figure 6-2 shows the location of these samples and Table 6-3 summarizes the data. No soil samples contained total VOC concentrations above 1 mg/kg.

6.5.2.2 Semivolatile Organic Compounds. Nine SVOCs were detected in one surface soil sample at Site 2 as shown in Table 6-4 and on Figure 6-2. These SVOCs are the PAH compounds fluoranthene, pyrene, benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, indeno(1,2,3-cd)-pyrene, and benzo(g,h,i)perylene. This soil sample contained total SVOC concentrations above 10 mg/kg.

6.5.2.3 Pesticides/PCBs. Two pesticides, 4,4'-DDE and 4,4'-DDT, and one PCB, Aroclor-1260, were detected in three soil samples. The detections of these compounds are listed on Table 6-4 and shown on Figure 6-3. No soil samples contained pesticides and PCBs at levels above 1 mg/kg.

6.5.2.4 Metals. The surface and subsurface soil samples were analyzed for 19 metals. The results were compared to the 95 percent/95 percent statistical tolerance interval presented for the Runway Area in the SWAT report and to Native Soil Concentrations of Various Elements (Dragun, 1988). The estimated background ranges of metals in soil are given in Table 3-1, and typical concentration ranges of metals occurring naturally in soil are given in Table 3-2. Eight metals were detected in 13 samples above the 95 percent/95 percent statistical tolerance interval upper limit: aluminum, arsenic, cadmium, copper, lead, vanadium, zinc, and mercury. All sample results fell within the expected range for native soils except for three metals. Mercury was detected in one sample at 0.27 mg/kg, above the expected maximum typical range for native soils of 0.08 mg/kg. Magnesium was detected in two samples, at 6,700 mg/kg and 9,000 mg/kg, slightly above the maximum of the expected range, 6,000 mg/kg. Arsenic was detected in eight samples above typical native soils range of 4 mg/kg. No extreme range has been established for these metals. Table 6-5 lists the metals detected at Site 2.

6.5.2.5 General Chemical Characteristics. Seven soil samples from Site 2 were analyzed for TOC. Table 6-6 lists the reported values and Figure 6-3 presents the data. Nineteen soil samples were analyzed for soil pH. Results are listed in Table 6-6.

6.5.2.6 Radionuclides. Gross alpha particles were detected at 16 sample locations, gross beta particles were detected at 18 sample locations, and radium-226 and radium-228 were detected at 17 and 13 sample locations, respectively. These detections are listed in Table 6-7.

6.6 SUMMARY AND CONCLUSIONS

The purpose of the data summary report is to provide a qualitative assessment of the Canonie data to identify whether sufficient information has been collected for the RI/FS evaluation. As discussed in Section 3, QA/QC information is not available for the data validation; therefore, the data presented in this report has not been validated under EPA CLP procedures.

Sixty-three soil samples from four borings were collected by Canonie from the fill, the Holocene Bay Mud Unit, and the late Pleistocene estuarine deposits. The borings were drilled to the following depths: WB-1 - 81 feet; WB-2 - 17.5 feet; WB-2B - 63 feet; WB-3 - 46.5 feet; and WB-4 - 51.5 feet. VOCs, SVOCs, metals, pesticides/PCBs, and radionuclides were detected in the Site 2 soil samples. In addition, pH was measured in 19 soil samples, and TOC was analyzed in 6 soil samples. No groundwater samples were collected at this site.

Methylene chloride was detected in 14 of the 15 samples analyzed for VOCs; two other VOCs, acetone and 2-butanone, were detected at 10.0 to 10.5 feet in WB-1, respectively. These VOCs, which are considered common laboratory artifacts, were detected at very low concentrations (less than 130 $\mu\text{g}/\text{kg}$). No soil samples contained total VOC concentrations above 1 mg/kg.

In only one sample, out of 19 samples analyzed, were SVOCs detected. The nine SVOCs, all PAHs, were detected in the surface sample at WB-3, located in the southwest corner of the site. These PAHs were detected at concentrations of 2,300 to 8,300 $\mu\text{g}/\text{kg}$. The PAHs detected at Site 2 are suspected of originating in the fill before it was brought to the landfill and are possibly a result of operations at the former oil refinery at what is now Site 13.

Eight metals were present in the surface and subsurface soil samples at concentrations exceeding the 95 percent/95 percent statistical tolerance limit of background concentrations at NAS Alameda (PRC/JMM, 1992c). Three metals, arsenic, mercury, and magnesium, were detected above the typical range for native soils (Dragun,

1988). The significance of the presence of metals above background levels will be further evaluated during the risk assessment to be performed during the comprehensive RI/FS process.

Two pesticides were detected in two samples at sampling location WB-1 (at the surface and at 10.5 to 11 feet), at concentrations less than or equal to 19 $\mu\text{g/kg}$. One PCB was detected in the surface sample at two sampling locations, WB-1 and WB-2, at concentrations less than or equal to 400 $\mu\text{g/kg}$.

If the analytical results can be validated and are considered to be acceptable, the following conclusions can be made:

- Only one soil sample collected from boring WB-3 contained total SVOC concentration above 10 mg/kg. No soil samples contained total VOC or pesticides and PCBs at concentrations above 1 mg/kg. The soil around boring WB-3 may have been significantly impacted by SVOCs. Combining these data with the data collected during the Phases 5 and 6 investigation, it is concluded that sufficient soil data have been collected to characterize the presence of SVOCs and other organics, as well as metals, in soil at Site 2.

The significance of the presence of these VOCs, SVOCs, pesticides and PCBs, and metals in the soil is further evaluated in the SWAT and DSR (PRC/Montgomery Watson, 1993c). The Canonic data together with the data collected during the SWAT investigation performed by the PRC team have been assessed to determine the need for follow-on sampling. An evaluation of all data collected at Site 1 will be conducted during the risk assessment to be performed during the comprehensive RI/FS work.

SITE 2 - WEST BEACH LANDFILL
SUMMARY OF LABORATORY ANALYSES PERFORMED ON SOIL SAMPLES
(Sheet 1 of 3)

Boring	Depth	Matrix	Alkalinity/Acidity	Ammonia	Ammonium	Asbestos (Tot)	Ash (Tot)	SVOC	BTU Value	Cations/Anions	CEC	Cyanide (Tot)	DO (Tot)	EDB	Herb Uniq	Herbicides	Mercury	Metals	Pes/PCB	pH	Phosphorus	Potassium	Radiation	Spec. Con.	Kjeldahl Nitrogen	TOC	TPH as Diesel	TRPH/Oil & Grease	TS/TDS	VOC
WB-1	0.0-0.5	Soil																												
WB-1	0.5-1.0	Soil																												
WB-1	1.0-1.5	Soil																												
WB-1	1.5-2.0	Soil																												
WB-1	10.0-10.5	Soil																												
WB-1	10.5-11.0	Soil																												
WB-1	11.0-11.5	Soil																												
WB-1	35.0-35.5	Soil																												
WB-1	35.5-36.0	Soil																												
WB-1	36.0-36.5	Soil																												
WB-1	79.5-80.0	Soil																												
WB-1	80.0-80.5	Soil																												
WB-1	80.5-81.0	Soil																												
WB-2	0.0-0.5	Soil																												
WB-2	0.5-1.0	Soil																												
WB-2	1.0-1.5	Soil																												
WB-2	5.0-5.5	Soil																												
WB-2	5.5-6.0	Soil																												
WB-2	6.0-6.5	Soil																												
WB-2	15.0-15.5	Soil																												
WB-2	15.5-16.0	Soil																												
WB-2	16.0-16.5	Soil																												
WB-2	17.0-17.5	Soil																												
WB-2B	45.0-45.5	Soil																												
WB-2B	45.5-46.0	Soil																												
WB-2B	46.0-46.5	Soil																												
WB-2B	61.5-62.0	Soil																												

SITE 2 - WEST BEACH LANDFILL
SUMMARY OF LABORATORY ANALYSES PERFORMED ON SOIL SAMPLES
(Sheet 2 of 3)

Boring	Depth	Matrix	Alkalinity/Acidity	Ammonia	Ammonium	Asbestos (Tot)	Ash (Tot)	SVOC	BTU Value	Cations/Anions	CEC	Cyanide (Tot)	DO (Tot)	EDB	Herb Uniq	Herbicides	Mercury	Metals	Pest/PCB	pH	Phosphorous	Potassium	Radiation	Spec. Con.	Kjeldahl Nitrogen	TOC	TPH as Diesel	TRPH/Oil&Grease	TS/TDS	VOC
WB-2B	62.0-62.5	Soil				*									*	*	*	*										*		
WB-2B	62.5-63.0	Soil																				*								
WB-3	0.0-0.5	Soil				*									*	*	*	*												
WB-3	0.5-1.0	Soil																				*								
WB-3	2.0-2.5	Soil			*																									
WB-3	2.5-3.0	Soil																							*					
WB-3	15.0-15.5	Soil																											*	
WB-3	15.5-16.0	Soil				*									*	*	*	*												*
WB-3	16.0-16.5	Soil																				*								*
WB-3	35.0-35.5	Soil																											*	
WB-3	35.5-36.0	Soil				*									*	*	*	*												*
WB-3	36.0-36.5	Soil																				*								*
WB-3	45.0-45.5	Soil																												*
WB-3	45.5-46.0	Soil				*									*	*	*	*												*
WB-3	46.0-46.5	Soil																				*								*
WB-3R	2.0-2.5	Soil				*									*	*	*	*												*
WB-3R	2.5-3.0	Soil																				*								*
WB-3R	3.0-3.5	Soil																												*
WB-3R	3.5-4.0	Soil																						*					*	
WB-4	0.0-0.5	Soil				*									*	*	*	*												*
WB-4	0.5-1.0	Soil																				*								*
WB-4	2.0-2.5	Soil			*																									
WB-4	2.5-3.0	Soil																							*					
WB-4	10.0-10.5	Soil													*	*	*	*											*	
WB-4	10.5-11.0	Soil				*									*	*	*	*											*	
WB-4	11.0-11.5	Soil																				*								*
WB-4	30.0-30.5	Soil																											*	

TABLE 6-1

SITE 2 - WEST BEACH LANDFILL
SUMMARY OF LABORATORY ANALYSES PERFORMED ON SOIL SAMPLES
(Sheet 3 of 3)

Boring	Depth	Matrix	Alkalinity/Acidity	Ammonia	Ammonium	Asbestos (Tot)	Ash (Tot)	SVOC	BTU Value	Cations/Anions	CEC	Cyanide (Tot)	DO (Tot)	EDB	Herb Uniq	Herbicides	Mercury	Metals	Pest/PCB	pH	Phosphorous	Potassium	Radiation	Spec. Con.	Kjeldahl Nitrogen	TOC	TPH as Diesel	TRPH/Oil&Grease	TS/TDS	VOC
WB-4	35.0-35.5	Soil				.									.	.	.	.
WB-4	35.5-36.0	Soil																			.									
WB-4	50.0-50.5	Soil																											.	
WB-4	50.5-51.0	Soil				.									.	.	.	.
WB-4	51.0-51.5	Soil																			.									
WB-4R	0.0-0.5	Soil				.									.	.	.	.
WB-4R	0.5-1.0	Soil																			.									
WB-4R	1.0-1.5	Soil																					.							
WB-4R	1.5-2.0	Soil																											.	
Summary		Soil			5	19									19	19	19	19			19			7			2		15	

Notes:

Analysis	Methods	Matrix
TOC	EPA 29-3.52	soil
Asbestos	Asbestos	soil
Metals	EPA 6010	soil
Mercury	EPA 7471	soil
Pest/PCB	EPA 8080	soil
VOC	EPA 8240	soil
SVOC	EPA 8270	soil
pH	EPA 9045	soil
Radiation	Radiation	soil

TABLE 6-2

**SITE 2 - WEST BEACH LANDFILL
GEOTECHNICAL SAMPLE LABORATORY TEST RESULTS**

Sample No.	Depth (ft)	Soil Classification		Moisture Content (%)	Dry Density (pcf)	Specific Gravity	Hydraulic Conductivity (cm/s)
		Laboratory	Field				
WB-1	0	SM	SM	8.4	100.1	NA	6.0E-04
WB-1	20.5	SC	CL	34.4	85.4	NA	NA
WB-1	36.5	CL	CL	35.2	85.0	2.65	NA
WB-2	90	CH	CH	NA	NA	2.66	NA
WB-3R	0	SP/SM	SP	1.6	98.3	NA	NA
WB-3R	2.5	SP	SP	5.3	97.8	NA	9.0E-04
WB-3	16.5	SP	SP	18.3	103.6	2.65	NA
WB-3	17.5	SP	SP	20.0	102.8	NA	8.0E-04
WB-3	37	SW	SM	19.1	117.1	2.71	2.0E-04
WB-3	46.5	SM	SM	20.0	110.7	2.69	3.0E-07
WB-3	48	SP	SM	20.2	108.7	NA	3.0E-04
WB-4	0	SP	SP/SM	2.1	87.2	NA	1.0E-03
WB-4	1.5	SP/SM	SP/SM	1.9	90.1	NA	NA
WB-4	104	CH	CL	NA	NA	2.59	NA

Notes:

NA - Not Analyzed

Parameters not detected are reported as less than method detection limit.

Laboratory Methods (Units):

Soil Classification - Unified Soil Classification System (USCS) - ASTM D2488

Moisture Content - ASTM D2216 (percent)

Dry Density - ASTM D2937 (pounds per cubic foot)

Specific Gravity - ASTM D854

Hydraulic Conductivity - EPA 9100 (centimeters per second)

Soil Classification Legend:

GW	Well graded gravels, gravel-sand mixtures, little or no fines	SM	Silty sands, sand-silt mixtures
GP	Poorly graded gravels, gravel-sand mixtures, little or no fines	SC	Clayey sands, sand-clay mixtures
GM	Silty gravels, gravel-sand-silt mixtures	ML	Inorganic silts and very fine sands, rock flow silty or clayey fine sands or clayey silts with slight plasticity
GC	Clayey gravels, gravel-sand-clay mixtures	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
SW	Well graded sands, gravelly sands, little or no fines	OL	Organic silts and organic silty clays or low plasticity
SP	Poorly-graded sands, gravelly sands, little or no fines	CH	Inorganic clays of high plasticity, fat clays

TABLE 6-3

**SITE 2 - WEST BEACH LANDFILL
RESULTS FOR VOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES**

Parameter Reported	WB-1 06/01/90 10-10.5 ft	WB-1 06/01/90 35-35.5 ft	WB-1 06/01/90 79.5-80 ft	WB-2 05/24/90 5-5.5 ft	WB-2B 05/29/90 45-45.5 ft	WB-2B 05/29/90 61.5-62 ft	WB-3 05/22/90 15-15.5 ft
Methylene Chloride (ug/kg)	22	10	8	18	43	40	25
Acetone (ug/kg)	130	<14.0	<12.0	<11.0	<13.0	<12.0	<12.0
2-Butanone (ug/kg)	51	<14.0	<12.0	<11.0	<13.0	<12.0	<12.0
Parameter Reported	WB-3 05/22/90 35-35.5 ft	WB-3 05/22/90 45-45.5 ft	WB-3R 05/23/90 3.5-4 ft	WB-4 05/21/90 10-10.5 ft	WB-4 05/21/90 30-30.5 ft	WB-4 05/21/90 50-50.5 ft	WB-4R 05/23/90 1.5-2 ft
Methylene Chloride (ug/kg)	23	21	11	25	16	17	12
Acetone (ug/kg)	<13.0	<12.0	<11.0	<13.0	<13.0	<13.0	<10.0
2-Butanone (ug/kg)	<13.0	<12.0	<11.0	<13.0	<13.0	<13.0	<10.0

Notes: NA = Not Analyzed
 < = Detection Limit
 ug/kg = micrograms per kilogram
 Data not validated by JMM

TABLE 6-4

**SITE 2 - WEST BEACH LANDFILL
RESULTS FOR SEMIVOLATILE ORGANIC COMPOUNDS AND
PESTICIDES AND PCB COMPOUNDS DETECTED IN SOIL SAMPLES**

Parameter Reported	WB-3 05/22/90 0-0.5 ft			
Semivolatile Compounds				
Fluoranthene (ug/kg)	2300			
Pyrene (ug/kg)	2700			
Benzo(a)anthracene (ug/kg)	2500			
Chrysene (ug/kg)	3300			
Benzo(b)fluoranthene (ug/kg)	8300			
Benzo(k)fluoranthene (ug/kg)	3400			
Benzo(a)pyrene (ug/kg)	5000			
Indeno(1,2,3-cd)pyrene (ug/kg)	2800			
Benzo(g,h,i)perylene (ug/kg)	4800			
Parameter Reported	WB-1 05/31/90 0-0.5 ft	WB-1 06/01/90 10.5-11 ft	WB-2 05/24/90 0-0.5 ft	
Pesticide/PCB Compounds				
4,4'-DDE (ug/kg)	<11.0	5.7	<4.30	
4,4'-DDT (ug/kg)	19	<2.40	<4.30	
Aroclor-1260 (ug/kg)	400	<61	380	

Notes: NA = Not Analyzed
 < = Detection Limit
 ug/kg = micrograms per kilogram
 Data not validated by JMM

TABLE 6-5

SITE 2 - WEST BEACH LANDFILL
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
(Sheet 1 of 3)

Parameter Reported	WB-1 05/31/90 0-0.5 ft	WB-1 06/01/90 10.5-11 ft	WB-1 06/01/90 35.5-36 ft	WB-1 06/01/90 80-80.5 ft	WB-2 05/24/90 0-0.5 ft	WB-2 05/24/90 5.5-6 ft	WB-2 05/24/90 16-16.5 ft
Aluminum (mg/kg)	8540	5310	18800	7910	9370	5290	7100
Arsenic (mg/kg)	14	12	32	15	<11.0	<11.0	<12.0
Barium (mg/kg)	86	40	30	<25.0	45	<21.0	36
Cadmium (mg/kg)	6.4	<1.20	<1.40	<1.20	6.2	<1.10	<1.20
Calcium (mg/kg)	11000	2400	3600	2400	4600	2300	3300
Chromium (mg/kg)	44	33	59	45	56	28	47
Cobalt (mg/kg)	6.4	<6.10	13	7	7.5	<5.30	6.2
Copper (mg/kg)	56	38	69	40	52	6.1	7.3
Iron (mg/kg)	15000	10300	29800	13200	16000	8650	12500
Lead (mg/kg)	81	29	16	7.2	31	<5.30	<6.20
Magnesium (mg/kg)	3800	2400	9000	3400	4700	2200	3900
Manganese (mg/kg)	240	92	230	130	220	97	130
Nickel (mg/kg)	41	29	62	37	52	26	43
Potassium (mg/kg)	1300	990	3200	1200	1400	620	920
Sodium (mg/kg)	710	<610	4200	710	730	<530	2200
Titanium (mg/kg)	430	440	878	520	470	410	610
Vanadium (mg/kg)	28	22	52	29	31	19	30
Zinc (mg/kg)	100	56	74	40	64	17	24
Mercury (mg/kg)	0.27	<0.240	<0.280	<0.250	<0.210	<0.210	<0.250

Notes: NA = Not Analyzed
< = Detection Limit
mg/kg = milligrams per kilogram
Data not validated by JMM

TABLE 6-5

**SITE 2 - WEST BEACH LANDFILL
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
(Sheet 2 of 3)**

Parameter Reported	WB-2B 05/29/90 45.5-46 ft	WB-2B 05/29/90 62-62.5 ft	WB-3 05/22/90 0-0.5 ft	WB-3 05/22/90 15.5-16 ft	WB-3 05/22/90 35.5-36 ft	WB-3 05/22/90 45.5-46 ft	WB-3R 05/23/90 2-2.5 ft
Aluminum (mg/kg)	12400	7970	4440	4430	6800	10300	4630
Arsenic (mg/kg)	<12.0	<12.0	10	<12.0	19	26	<11.0
Barium (mg/kg)	<24.0	48	31	<25.0	28	31	45
Cadmium (mg/kg)	<1.20	<1.20	5.1	<1.20	<1.20	<1.20	<1.10
Calcium (mg/kg)	3800	2800	2500	2200	2400	2200	2200
Chromium (mg/kg)	51	38	27	28	34	50	31
Cobalt (mg/kg)	9.2	<6.00	<5.20	<6.30	<6.00	7.4	<5.40
Copper (mg/kg)	32	10	15	19	26	31	23
Iron (mg/kg)	19500	13000	7940	7460	11900	15700	8770
Lead (mg/kg)	<6.10	<6.00	15	<6.30	<6.00	6.2	<5.40
Magnesium (mg/kg)	5200	3200	2100	2000	2800	3200	2000
Manganese (mg/kg)	170	140	110	81	120	140	97
Nickel (mg/kg)	42	41	28	22	29	52	25
Potassium (mg/kg)	1700	690	770	630	1100	1200	770
Sodium (mg/kg)	1400	1400	<520	<630	1100	2700	<540
Titanium (mg/kg)	749	540	410	440	520	600	440
Vanadium (mg/kg)	39	26	19	19	28	30	20
Zinc (mg/kg)	43	24	30	25	32	57	24
Mercury (mg/kg)	<0.240	<0.240	<0.210	<0.250	<0.240	<0.250	<0.220

Notes: NA = Not Analyzed
 < = Detection Limit
 mg/kg = milligrams per kilogram
 Data not validated by JMM

TABLE 6-5

SITE 2 - WEST BEACH LANDFILL
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
(Sheet 3 of 3)

Parameter Reported	WB-4 05/21/90 0-0.5 ft	WB-4 05/21/90 10.5-11 ft	WB-4 05/21/90 35-35.5 ft	WB-4 05/21/90 50.5-51 ft	WB-4R 05/23/90 0-0.5 ft
Aluminum (mg/kg)	5400	7190	9460	15500	4420
Arsenic (mg/kg)	<10.0	<13.0	<13.0	18	<11.0
Barium (mg/kg)	34	46	<25.0	27	<21.0
Cadmium (mg/kg)	<1.00	<1.30	<1.30	<1.30	<1.10
Calcium (mg/kg)	2600	3100	2100	2300	2000
Chromium (mg/kg)	34	36	38	49	30
Cobalt (mg/kg)	<5.20	<6.50	8.3	10	<5.30
Copper (mg/kg)	12	25	18	100	9.7
Iron (mg/kg)	8680	10300	14500	21600	8010
Lead (mg/kg)	9.7	<6.50	<6.30	13	<5.30
Magnesium (mg/kg)	2200	2900	4200	6700	2500
Manganese (mg/kg)	100	120	110	190	92
Nickel (mg/kg)	23	33	30	52	26
Potassium (mg/kg)	750	1100	1800	2600	<530
Sodium (mg/kg)	<520	<650	1800	1200	<530
Titanium (mg/kg)	513	659	500	677	370
Vanadium (mg/kg)	23	27	28	44	19
Zinc (mg/kg)	28	30	31	62	18
Mercury (mg/kg)	<0.210	<0.260	<0.250	<0.260	<0.210

Notes: NA = Not Analyzed
< = Detection Limit
mg/kg = milligrams per kilogram
Data not validated by JMM

TABLE 6-6

SITE 2 - WEST BEACH LANDFILL
RESULTS FOR GENERAL CHEMICAL CHARACTERISTICS IN SOIL SAMPLES
 (Sheet 1 of 2)

Parameter Reported	WB-1 05/31/90 1.5-2 ft	WB-2 05/24/90 1-1.5 ft	WB-2 05/24/90 15-15.5 ft	WB-3 05/23/90 2.5-3 ft	WB-3R 05/23/90 3-3.5 ft	WB-4 05/23/90 2.5-3 ft
Total Organic Carbon (%)	1.9	3.3	0.041	0.11	0.02	0.17
Parameter Reported	WB-4R 05/23/90 1-1.5 ft					
Total Organic Carbon (%)	0.12					
Parameter Reported	WB-2B 05/29/90 45.5-46 ft	WB-2B 05/29/90 62-62.5 ft				
Miscellaneous Measurements						
Total Solids (%)	82	83				

Notes: NA = Not Analyzed
 < = Detection Limit
 Data not validated by JMM

TABLE 6-6

SITE 2 - WEST BEACH LANDFILL
RESULTS FOR GENERAL CHEMICAL CHARACTERISTICS IN SOIL SAMPLES
(Sheet 2 of 2)

Parameter Reported	WB-1 05/31/90 0-0.5 ft	WB-1 06/01/90 10.5-11 ft	WB-1 06/01/90 35.5-36 ft	WB-1 06/01/90 80-80.5 ft	WB-2 05/24/90 0-0.5 ft	WB-2 05/24/90 5.5-6 ft	WB-2 05/24/90 16-16.5 ft
Characteristic Measurements pH (Units)	9.6	9.9	10	10	8.9	5.8	8.7
Parameter Reported	WB-2B 05/29/90 45.5-46 ft	WB-2B 05/29/90 62-62.5 ft	WB-3 05/22/90 0-0.5 ft	WB-3 05/22/90 15.5-16 ft	WB-3 05/22/90 35.5-36 ft	WB-3 05/22/90 45.5-46 ft	WB-3R 05/23/90 2-2.5 ft
Characteristic Measurements pH (Units)	8.3	6.2	9.3	9.1	8.1	5.6	6.7
Parameter Reported	WB-4 05/21/90 0-0.5 ft	WB-4 05/21/90 10.5-11 ft	WB-4 05/21/90 35-35.5 ft	WB-4 05/21/90 50.5-51 ft	WB-4R 05/23/90 0-0.5 ft		
Characteristic Measurements pH (Units)	7.3	8.6	8.3	7.9	7.9		

Notes: NA = Not Analyzed
< = Detection Limit
Data not validated by JMM

TABLE 6-7

**SITE 2 - WEST BEACH LANDFILL
RESULTS FOR RADIONUCLIDES DETECTED IN SOIL SAMPLES**

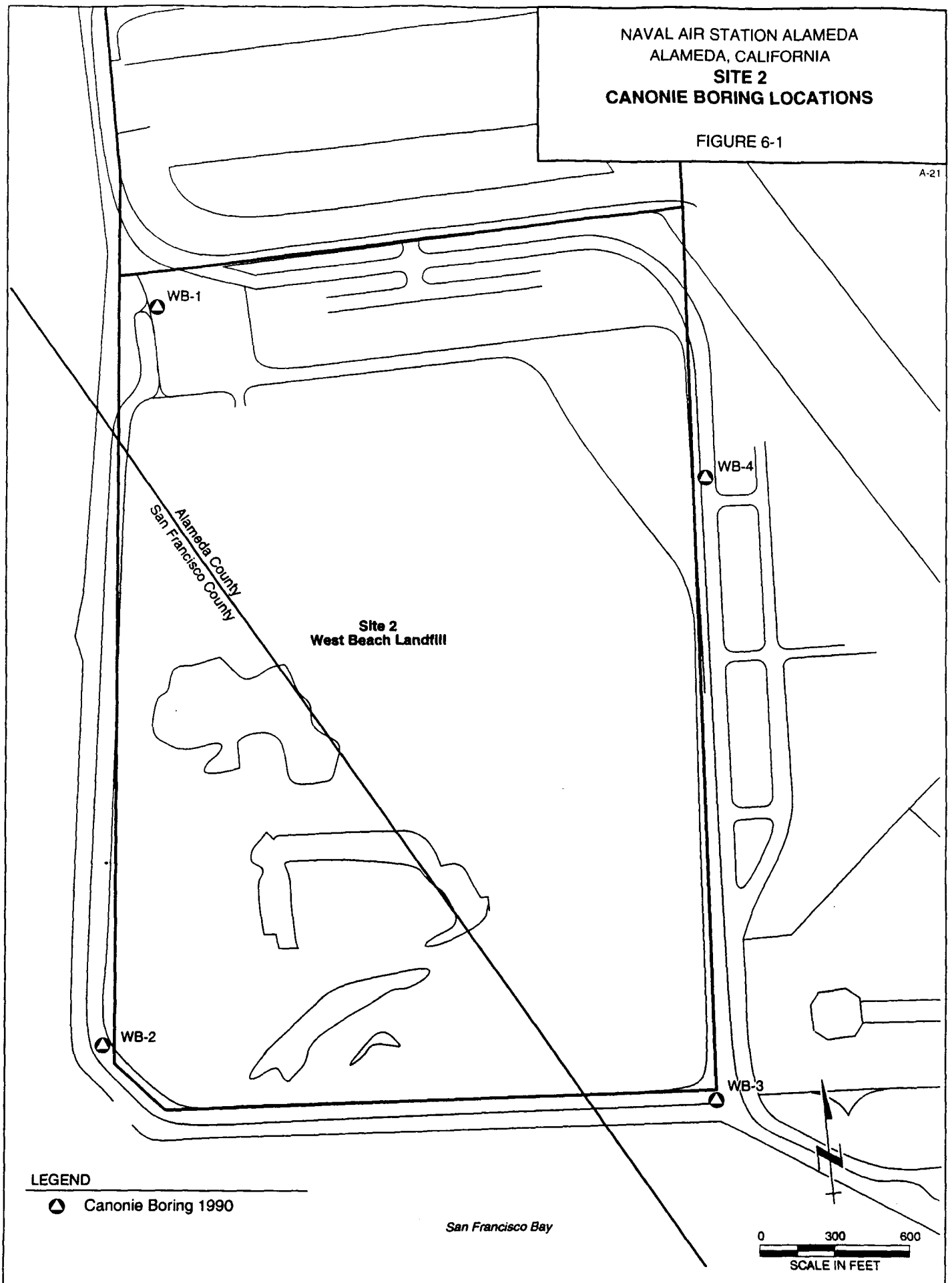
Parameter Reported	WB-1 05/31/90 0.5-1 ft	WB-1 06/01/90 11-11.5 ft	WB-1 06/01/90 36-36.5 ft	WB-1 06/01/90 80.5-81 ft	WB-2 05/24/90 0.5-1 ft	WB-2 05/24/90 6-6.5 ft	WB-2 05/24/90 17-17.5 ft
Gross Alpha (pCi/g)	3.4	4	8.8	<0.000	2.3	<0.000	1.8
Gross Beta (pCi/g)	12	5.7	5.9	9	10	12	9.5
Radium 226 (pCi/g)	0.6	0.4	0.3	0.5	0.4	0.3	0.4
Radium 228 (pCi/g)	0.8	0.4	<0.000	0.6	0.5	0.8	1
Parameter Reported	WB-2B 05/29/90 46-46.5 ft	WB-2B 05/29/90 62.5-63 ft	WB-3 05/22/90 0.5-1 ft	WB-3 05/22/90 16-16.5 ft	WB-3 05/22/90 36-36.5 ft	WB-3 05/22/90 46-46.5 ft	WB-3R 05/23/90 2.5-3 ft
Gross Alpha (pCi/g)	9.6	5.7	0.7	1.3	9.8	2.9	9.3
Gross Beta (pCi/g)	12	14	11	10	3.9	6.2	11
Radium 226 (pCi/g)	<0.000	<0.000	0.8	0.3	0.8	0.4	1.5
Radium 228 (pCi/g)	0.6	0.2	0.6	<0.000	0.8	<0.000	1.2
Parameter Reported	WB-4 05/21/90 0.5-1 ft	WB-4 05/21/90 11-11.5 ft	WB-4 05/21/90 35.5-36 ft	WB-4 05/21/90 51-51.5 ft	WB-4R 05/23/90 0.5-1 ft		
Gross Alpha (pCi/g)	3	3	5.3	4.7	<0.000		
Gross Beta (pCi/g)	3.1	<0.000	16	14	11		
Radium 226 (pCi/g)	0.3	0.5	0.2	0.6	2.1		
Radium 228 (pCi/g)	<0.000	2.3	<0.000	<0.000	0.3		

Notes: NA = Not Analyzed
 < = Detection Limit
 pCi/g = picocuries per gram
 Data not validated by JMM

NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
SITE 2
CANONIE BORING LOCATIONS

FIGURE 6-1

A-21



NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
SITE 2 - WEST BEACH LANDFILL
VOLATILE AND SEMIVOLATILE ORGANIC
COMPOUNDS IN SOIL

FIGURE 6-2

A-21

WB-1	Depth (ft)	10-10.5	35-35.5	79.5-80
VOC (µg/kg)				
Methylene Chloride		22	10	8
Acetone		130	<14.0	<12.0
2-Butanone		51	<14.0	<12.0

WB-1

WB-4	Depth (ft)	10-10.5	30-30.5	50-50.5	WB-4R 1.5-2
VOC (µg/kg)					
Methylene Chloride		25	16	17	12

WB-4

Site 2
West Beach Landfill

WB-2	Depth (ft)	WB-2B 45-45.5	WB-2B 61.5-82
VOC (ug/kg)			
Methylene Chloride	18	43	40

WB-2, 2B

WB-3	Depth (ft)	15-15.5	35-35.5	45-45.5	WB-3R 3.5-4
VOC (µg/kg)					
Methylene Chloride		25	23	21	11
WB-3					
	Depth (ft)	0-0.5 ft			
SVOC (µg/kg)					
Fluoranthene		2300			
Pyrene		2700			
Benzo(a)anthracene		2500			
Chrysene		3300			
Benzo(b)fluoranthene		8300			
Benzo(k)fluoranthene		3400			
Benzo(a)pyrene		5000			
Indeno(1,2,3-cd)pyrene		2800			
Benzo(g,h,i)perylene		4800			

WB-3

San Francisco Bay

LEGEND

○ Canone Boring 1990

NOTES:

Boring and monitoring well locations were obtained from a base map provided by Canone Environmental, Inc. The individual locations were digitized onto a base map CAD file provided by NAS Alameda.

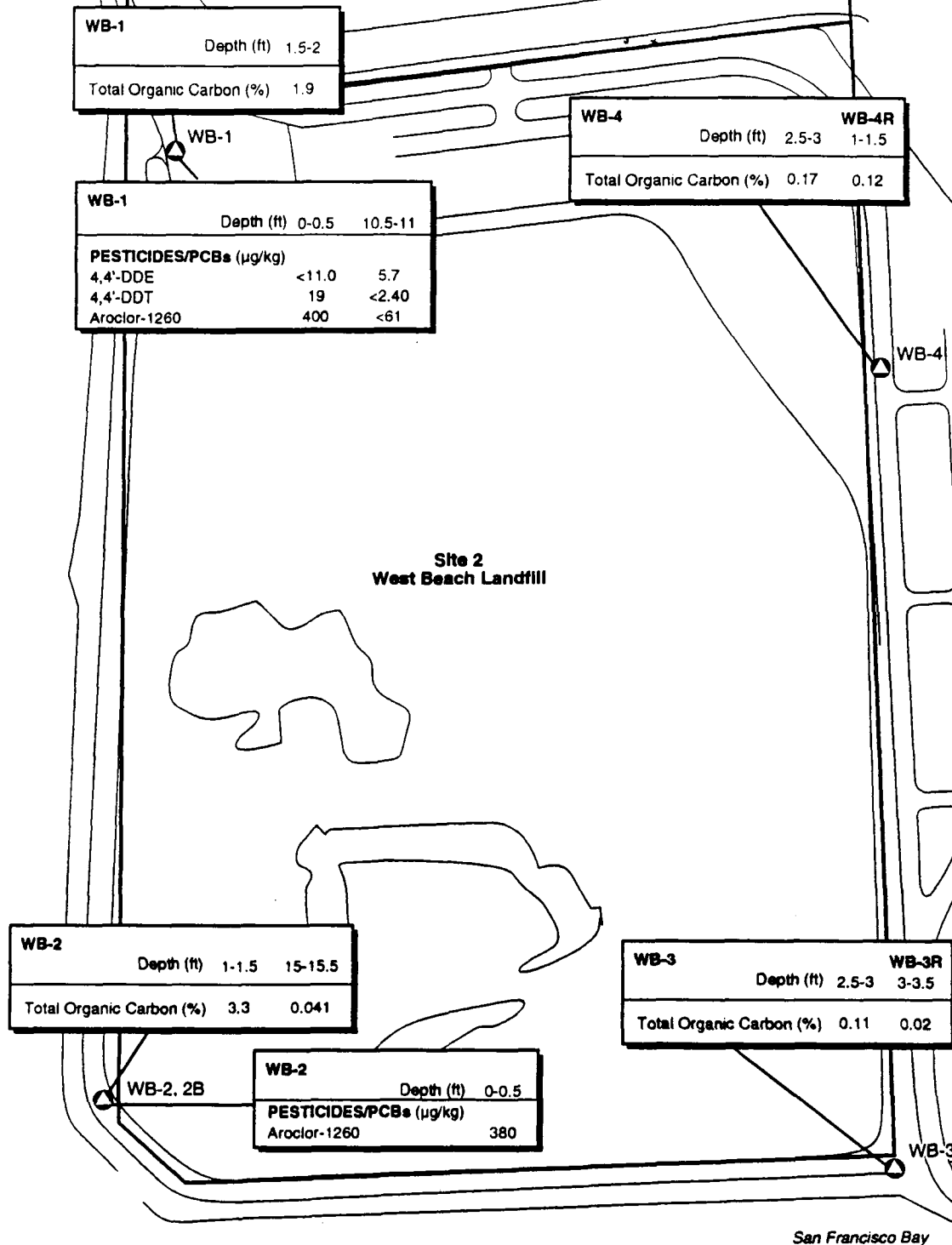
All data shown on figures is from the Canone investigation and reflects detections only. At present, data has not been independently validated, and laboratory qualifiers are not shown.

0 250 500
SCALE IN FEET

NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
SITE 2 - WEST BEACH LANDFILL
PESTICIDE AND PCB COMPOUNDS AND
TOTAL ORGANIC CARBON IN SOIL

FIGURE 6-3

A-21



LEGEND

▲ Canone Boring 1990

NOTES:

Boring and monitoring well locations were obtained from a base map provided by Canone Environmental, Inc. The individual locations were digitized onto a base map CAD file provided by NAS Alameda.

All data shown on figures is from the Canone investigation and reflects detections only. At present, data has not been independently validated, and laboratory qualifiers are not shown.

0 250 500
SCALE IN FEET

7.0 SITE 3 - AREA 97, ABANDONED FUEL STORAGE AREA

7.1 SITE DESCRIPTION AND BACKGROUND

Site 3 (Initial Assessment Study, Site 4) consists of an abandoned fuel storage area, Area 97, that is located in an inner island of Atlantic Avenue, approximately 200 feet west of the East Gate (Figure 1-2). The 2-acre site contained four partially buried concrete tanks lined with carbolite and one partially buried steel tank. Each tank contained exclusively 115/145 aviation gasoline (AVGAS) with a nominal capacity of 100,000 gallons (E&E, 1983). The four concrete tanks were installed in 1943 and the steel tank was added in 1962 to increase the facility's storage capacity. In 1975, three of the four concrete tanks were discovered to be leaking and, subsequently, they were drained, cleaned, and filled with water. In 1978, the one remaining concrete tank was also discovered to be leaking. It and the steel tank were drained and filled with water. However, the two tanks were not cleaned and 1 to 2 inches of AVGAS remained on the surface of the water in the tanks (E&E, 1983). The four concrete tanks were reportedly destroyed and buried in place. No information is available on the timing of the tank destruction or the fate of the steel tank.

Based on tank inventories, NAS Supply Fuels Branch personnel estimated that approximately 365,000 gallons of AVGAS may have escaped from the fuel storage area in the 1960s and early 1970s. The escaped fuel caused serious vapor problems in adjacent underground utilities resulting in an explosion and fire in 1977 that injured a contractor. Between 1978 and 1983, high gasoline vapors also caused several evacuations of the building located immediately north of Site 3 (E&E, 1983).

7.2 CURRENT USE

Site 3 is currently landscaped and used for an aircraft exhibit near the East Gate of the Naval Air Station. The exhibit consists of a naval aircraft that is centrally mounted on a pedestal in a grass-covered area.

7.3 PREVIOUS INVESTIGATIONS

Previous investigations were performed by Kennedy Engineers (Kennedy) and Wahler Associates (Wahler).

7.3.1 Kennedy Engineers, 1980

In 1979, the Navy contracted Kennedy to investigate the extent of the subsurface fuel contamination in the vicinity of Site 3. Kennedy installed 18 monitoring wells and collected soil and groundwater samples for gasoline analysis at each location. The approximate locations of 16 of these wells are shown in Figure 7-1; two wells (OW-8 and OW-32) are located outside of the map area. Kennedy also conducted a fuel vapor survey in the electrical duct manholes, storm drain manholes, and sanitary sewer manholes surrounding Site 3.

Gas chromatograph analysis with pentane extraction was conducted on the soil and groundwater samples obtained at each of the 18 drilling locations. Kennedy compared the chromatograms with standard "curves" produced by analysis of known fuel types. On this basis, they concluded that the hydrocarbons detected in the samples were AVGAS. Three soil samples obtained from OW-1, OW-16, and OW-23 contained AVGAS concentrations of 1,100, 9,200, and 7,600 mg/kg, respectively. The remaining soil samples reported no hydrocarbons, with a detection limit of 720 mg/kg. Six of the groundwater samples reported hydrocarbons concentrations between 4 and 41 milligrams per liter (mg/L); the remaining twelve groundwater samples reported no AVGAS hydrocarbons with a detection limit of 3 mg/L. One well (OW-6) that did not report AVGAS-range hydrocarbons did contain 1,410 mg/L of oil and grease-range hydrocarbons. These hydrocarbons were reported to be "a heavy, dark, highly viscous oil" (Kennedy, 1980).

Kennedy also conducted a manhole fuel vapor survey around Site 3, apparently utilizing an organic vapor meter (OVM) calibrated to hexane. The manhole fuel vapor survey reported vapor concentrations ranging from nondetectable to greater than 10,000 parts per million (ppm). The highest reading was obtained from a sanitary sewer manhole adjacent to the Seaplane Lagoon, south of the intersection of Avenue L and Fifth Street. There was no clear pattern to the fuel vapors levels measured in the survey. Kennedy concluded that the bulk of the AVGAS fuel released was transported away from the site through infiltration into storm sewers and sanitary sewers.

7.3.2 Wahler Associates, 1985

A subsequent investigation was conducted by Wahler in 1985 as part of the verification step of the NACIP confirmation study. Wahler installed and sampled three new observations wells (Figure 7-1) in addition to resampling 12 of the wells installed by Kennedy. Wahler also had the opportunity to make observations of subsurface soil and groundwater conditions during the construction of new utility trenches running south and west of the five former partially buried tanks in 1985.

Wahler used a similar technique to that of Kennedy to quantify the hydrocarbon content of groundwater samples; however, they state in their report that they compared the chromatograms to a standard produced from commercial unleaded gasoline and that quantitation was based on the average response from seven of the major gasoline components. These results revealed that one of the 15 groundwater samples and the one water sample obtained from a trench reported gasoline-range hydrocarbons in excess of 1 mg/L. Well OW-14 reported 7.5 mg/L and the trench water sample reported 3,900 mg/L of gasoline-range hydrocarbons. The location of this trench sample is shown on Figure 7-1. In addition, well OW-6 still contained a heavy black oily substance as reported in the Kennedy investigation.

During the observation of trench digging in 1985, Wahler noted free product on the trench inflow water at the location shown in Figure 7-1. Wahler recommended further investigation to the west, northwest, and north of the western end of Site 3 due to the fact that floating product was noted to be entering the trench in this area.

No information is available regarding the current status of most of the 21 wells installed by Kennedy and Wahler. The PRC team attempted to locate OW-2, OW-21, and OW-28 during the Phases 2B and 3 investigation of Buildings 162 and 14. The PRC team was able to locate well WA-8. Further attempts to locate existing wells will be made by the PRC team in any subsequent field investigation.

7.4 REMEDIAL INVESTIGATION

The investigation conducted by Canonie in 1990 at Site 3 included a soil gas survey, drilling/installation of three groundwater monitoring wells, and soil and groundwater sampling. Figure 7-2 shows the locations of the soil gas survey points and groundwater monitoring wells from the Canonie investigation. The soil gas survey was performed using a grid with approximately 100-foot spacing (Figure 7-2). A total of 121 samples were collected in the field in an attempt to delineate the extent of petroleum hydrocarbon vapors in the soil. Soil samples taken during the drilling of the monitoring wells and groundwater from the monitoring wells were analyzed to define the full extent of the migration and subsequent concentration levels of AVGAS at the site (Canonie, 1990c). Table 7-1 is a complete table of the analyses performed on each soil and groundwater sample.

7.4.1 Site Geology/Hydrogeology

Borehole logs and well construction details are presented in Appendix C. Figure 7-3 presents a cross section showing the subsurface stratigraphy at Site 3 based on the Canonie borehole logs. Artificial fill was encountered in the three borings to depths between 8 and 12 feet bgs. The fill underlying the site consists of

gray to dark gray sandy clay, silty clay, and silty sand. Bay Mud deposits directly underlie the fill in two wells, MW97-1 and MW97-3. The Merritt Sand was found beneath the fill in MW97-2 and was encountered below the Bay Mud in MW97-1 and MW97-3 (Figure 7-3). The Bay Mud consists of dark gray to gray, silty clay and the Merritt Sand is composed of orange-brown mottled, clayey, fine sand with abundant iron oxide stains. Geotechnical analytical data are listed in Table 7-2, and the laboratory data sheets are provided in Appendix D.

During drilling, groundwater was encountered at depths of 5.5, 9.3, and 4.5 feet bgs in wells MW97-1, MW97-2, and MW97-3, respectively. The depths to groundwater as measured by Canonic on November 8, 1990 were 5.94, 6.04, and 6.04 feet for wells MW97-1, MW97-2, and MW97-3, respectively. Figure 2-4 shows the November 8, 1990 groundwater contours at Site 3. Based on data from the three monitoring wells, apparent groundwater flow was generally to the east at a gradient of approximately 0.006 foot/foot. However, this flow direction is not consistent with general gradients in the eastern portion of NAS Alameda and may not be representative of actual conditions. Groundwater samples collected from these three monitoring wells contained TDS concentrations ranging from 1,280 to 22,300 mg/L.

7.4.2 Soil Gas Survey Results

The soil gas survey performed at Site 3 targeted the aromatic compounds benzene, toluene, ethylbenzene, and xylenes (BTEX), and total hydrocarbons (THC). Table 7-3 shows the BTEX and THC values recorded in the survey. Copies of the condensed data provided by the soil gas subcontractor are provided in Appendix B. Figures 7-4 and 7-5 illustrate the distribution of benzene and THC concentrations identified in the soil gas survey. Detected benzene concentrations ranged between 0.04 and 73,000 $\mu\text{g/L}$, and THC concentrations were between 0.2 and 960,000 $\mu\text{g/L}$. The highest concentration of benzene detected in the survey was from a depth of 5 feet bgs at point D9, approximately 50 feet northwest of the former tank farm. The highest THC concentration was from point C8, approximately 140 feet northwest of point D9. In addition, vapor-phase petroleum hydrocarbon compounds (BTEX) are present along the eastern edge of the Seaplane Lagoon. In general, elevated levels of BTEX are found in soil gas survey points where elevated THC concentrations are reported.

7.4.3 Analytical Results - Soil Samples

Soil samples were collected at Site 3 during drilling of wells MW97-1, MW97-2, and MW97-3. At each boring, samples were collected at 1- to 1.5-foot intervals for a total of 36 soil samples. The surface and subsurface soil samples were selectively analyzed for VOCs, SVOCs; TRPH; EDB; metals; and general chemical characteristics, such as ash, ammonium, and British thermal units (BTU). Additionally, subsurface

samples were analyzed for VOCs and ethylene dibromide (EDB). Table 7-1 provides a summary of analyses by sample. The analytical results are summarized in Tables 7-4 through 7-8 and shown on Figures 7-6 and 7-7. The figures and tables present only compounds that were detected.

7.4.3.1 Volatile Organic Compounds. Analytical results for VOCs detected in Site 3 soils are summarized in Table 7-4 and shown on Figure 7-6. Seventeen soil samples were analyzed for VOCs. Low levels of methylene chloride, acetone, toluene, and carbon disulfide were detected in the soil samples. Methylene chloride was detected in 14 soil samples at various depths in all three well borings. Acetone was detected in 12 soil samples at various depths in all three well borings. Toluene was found in 13 soil samples at various depths in all three well borings. Carbon disulfide was found in only one sample from MW97-2. No soil samples contained total VOC concentrations above 1 mg/kg.

7.4.3.2 Semivolatile Organic Compounds. The analytical results for SVOCs in soil are summarized in Table 7-5 and Figure 7-6. SVOCs were detected in only one of 16 soil samples analyzed for SVOCs at Site 3. Pyrene and benzo(g,h,i)perylene, both of which are PAH compounds, were detected in the 10.5- to 11.0-foot sample from MW97-3, which is located within the Site 3 area. Total SVOC concentrations did not exceed the preliminary comparison level of 10 mg/kg of total SVOCs.

7.4.3.3 Total Recoverable Petroleum Hydrocarbons. Analytical results for petroleum hydrocarbon compounds detected in Site 3 soils are summarized in Table 7-6 and Figure 7-6. Site 3 soils were analyzed for TRPH only. TRPH was detected in 9 of 16 soil samples. TRPH was reported in the unsaturated zone and in the saturated zone at each of the three borings. In borings MW97-1 and MW97-3, one sample from each had TRPH detected at concentrations slightly above the preliminary comparison level of 100 mg/kg of TRPH.

7.4.3.4 Ethylene Dibromide. Ethylene dibromide has been used in gasoline as an antiknock agent. Thirteen soil samples were analyzed for EDB; no detections were reported.

7.4.3.5 Metals. Analytical results for metals in Site 3 soils are summarized in Table 7-7. Background ranges of metals in soil have been estimated for NAS Alameda based on a study conducted by the PRC team under CTO 121 Mod. 0001. Results of this study are included in the Draft Final Data Summary Report, Background and Tidal Influence Studies, Additional Work at Sites 4 and 5 (PRC/JMM, 1992c). The estimated background ranges of metals in soil are given in Table 3-1. Based on these background data, 13 metals were detected above the 95 percent/95 percent statistical tolerance interval of background concentrations at NAS Alameda. However, as noted below, all but copper and magnesium are within normal or extreme

concentrations found in typical soils. In the 7-foot sample from MW97-1, the reported concentration of magnesium was within background levels.

Typical concentration ranges of metals occurring naturally in soil are given in Table 3-2 (Dragun, 1988). Based on these ranges, concentrations of two metals, magnesium and copper, exceeded their typical ranges. Concentrations of magnesium exceeded the typical range in three samples: the 7.0- to 7.5-foot sample from MW97-1, the 3.5- to 4.0-foot sample from MW97-2, and the 7.0- to 7.5-foot sample also from MW97-2. No extreme upper limit is given for magnesium (Table 3-2). Copper was detected at concentrations exceeding typical levels in soil. The highest concentration of copper was detected in the 7.0- to 7.5-foot sample from boring MW97-1. Copper concentrations, however, were well within the extreme limit typically found in soil.

7.4.3.6 General Chemical Characteristics. Analytical results for general chemical characteristics are summarized in Table 7-8 and Figure 7-7. The 3-foot soil sample from each of the three borings was analyzed for soil pH. The 4-foot soil sample from the three borings was analyzed for the following parameters: percent ash, chloride, ammonium, nitrate (as N), sulfate, total Kjeldahl nitrogen (TKN), total phosphorous, BTU, and TOC. BTU is not shown on the table of detections (Table 7-8) because values were below detection limits.

7.4.4 Analytical Results - Groundwater Samples

Groundwater samples were collected from three monitoring wells installed at and adjacent to Site 3. All groundwater samples were analyzed for VOCs, SVOCs, oil and grease, EDB, metals, and general chemical characteristics. In addition, three travel blank samples were analyzed for VOCs. Table 7-1 presents a summary of analyses by sample. Tables 7-9 through 7-11 and Figure 7-8 summarize the analytical results for groundwater at Site 3. The travel blank samples are identified in Table 7-9 with a 200-series number. The figures and tables show only compounds that were detected.

7.4.4.1 Volatile Organic Compounds. Analytical results for VOCs in groundwater are summarized in Table 7-9. No VOCs were detected in the three groundwater samples collected from Site 3. Methylene chloride, however, was detected in a travel blank sample.

7.4.4.2 Semivolatile Organic Compounds. SVOCs were not detected in groundwater samples from the three Site 3 monitoring wells.

7.4.4.3 Oil and Grease. The groundwater samples from Site 3 were analyzed for oil and grease compounds. No detections of oil and grease were reported.

7.4.4.4 Ethylene Dibromide. EDB was not detected in the groundwater samples from the three Site 3 monitoring wells.

7.4.4.5 Metals. Analytical results for metals in groundwater are summarized in Table 7-10 and on Figure 7-8. According to the Canonic QAPP and QA/QC plan, groundwater samples for metals were field-filtered as appropriate with a 0.45-micron filter (Canonic, 1990b). Background ranges of metals in groundwater have been estimated for NAS Alameda based on a study conducted by the PRC team under CTO 121 Mod. 0001. Results of this study are included in the background data summary report (PRC/JMM, 1992c). Table 3-3 presents the estimated background ranges of metals in groundwater. Based on these background data, barium, magnesium, manganese, and potassium, which had concentrations at Site 3 that exceeded typical levels, were within background levels (95 percent/95 percent statistical tolerance levels) estimated for NAS Alameda. Sodium exceeded typical concentrations in two of three samples but exceeded background concentrations in only one of the three samples. No value for lead in groundwater was reported.

Typical concentration ranges of metals occurring naturally in groundwater are given in Table 3-4 (Dragun, 1988). Based on these ranges, groundwater samples from at least one of the three wells exceeded the typical ranges for aluminum, chromium, copper, iron, manganese, nickel, potassium, titanium, and vanadium. Although no extreme concentration limits are provided for some of the elements, of those provided, the extreme upper limit for vanadium was exceeded in all three wells.

7.4.4.6 General Chemical Characteristics. General chemical analyses performed on the groundwater samples from Site 3 include specific conductivity, dissolved oxygen, pH, TOC, total alkalinity (as CaCO_3), bicarbonate alkalinity (also as CaCO_3), TDS, and total hardness (as CaCO_3). Results of the general chemical analyses are presented in Table 7-11 and shown on Figure 7-8.

7.5 SUMMARY AND CONCLUSIONS

The purpose of the data summary report is to provide a qualitative assessment of the Canonic data to identify whether sufficient information has been collected for the RI/FS evaluation. As discussed in Section 3, QA/QC information is not available for the data validation; therefore, the data presented in this report have not been validated under EPA CLP procedures.

7.5.1 Soil Gas Survey

The investigation conducted by Canonie at Site 3 included a soil gas survey which targeted the aromatic hydrocarbon compounds BTEX and THC. The soil gas survey was performed over a grid with approximately 100-foot spacing. A total of 121 samples were collected at depths of 2 to 6 feet bgs.

Elevated concentrations of both BTEX and THC vapors were detected in the soil. Concentrations of benzene were distributed over the Site 3 area and to the northwest with a maximum concentration of 73,000 $\mu\text{g/L}$ centered just northwest of the site. Similarly, THC vapors were detected at a maximum concentration of 960,000 $\mu\text{g/L}$ centered just northwest of the maximum detection of benzene. The pattern of both soil gas plumes indicate movement from the abandoned fuel storage area to the northwest.

7.5.2 Soils

A total of 36 surface and subsurface samples were collected by Canonie during the drilling of the three monitoring wells at and adjacent to Site 3. Samples were collected from the artificial fill, the Holocene Bay Mud Unit, and the Merritt Sand which have been identified at Site 3. VOCs, SVOCs, and TRPH were detected in the Site 3 soil samples.

VOCs and TRPH were detected in soil samples collected from both the fill and the Merritt Sand in all three wells except MW97-2. VOCs were detected at MW97-2, but TRPH was not detected in the Merritt Sand. MW97-2 is located about 175 feet northeast of the site. TRPH was also detected at elevated levels (>100 mg/kg) in the surface sample from MW97-3, which is located within the central portion of the site, and within the saturated zone in MW97-1, which is located north of the site. SVOCs (PAH compounds) were detected only in the 10.5-11 foot sample from MW97-3. No SVOCs were detected in the deeper sample from that site. VOCs were detected in soil samples at levels that are significantly below a combined VOC concentration of 1 mg/kg. In general, soils with total VOC concentrations below the preliminary comparison level of 1 mg/kg will not be considered as having elevated concentrations. Total SVOCs were also detected at concentrations below the preliminary comparison level of 10 mg/kg for total SVOCs. TRPH, however, were detected at levels above the preliminary comparison level of 100 mg/kg in two samples.

Previous investigations reported that AVGAS-range hydrocarbons were detected in both the soil and groundwater (Kennedy, 1980). Possible groundwater flow direction was reported as northwest and soil gas results supported AVGAS migration in that direction. None of the Canonie borings are located to the northwest of the abandoned fuel storage area.

Thirteen metals are present in the soil samples at concentrations exceeding the 95 percent/95 percent statistical tolerance limit of background concentrations at NAS Alameda (PRC/JMM, 1992c). Two samples from MW97-2 had a particularly large number of metals present at levels above the 95 percent/95 percent level. With the exception of copper and magnesium, however, all metals analyzed were within the range of concentrations typically found in soils.

If the analytical results can be validated and are considered to be acceptable, the following conclusions can be made:

- Concentrations of VOCs and SVOCs in soil samples collected from the storage area and to the northeast do not exceed the corresponding preliminary comparison levels. EDB was not detected in the soil samples. However, sufficient soil data have not been collected to the north and northwest of the site for the RI/FS evaluation. TRPH concentrations exceeded the preliminary comparison level in monitoring well MW97-1, located north of the site, and well MW97-3, at the site.
- None of Canonie's soil samples were collected from the areas where elevated soil gas levels were found nor from areas where previous investigations detected high hydrocarbon concentrations such as near the storm and sanitary sewer fill material. Therefore, additional soil investigation of the area northwest of the site and near the 1985 trench is necessary to evaluate the VOCs, petroleum hydrocarbons, and metals in the subsurface.

The significance of the presence of these VOCs, SVOCs, TRPH, and metals in soil will be further evaluated during the risk assessment to be performed during the comprehensive RI/FS work.

7.5.3 Groundwater

Three monitoring wells were installed by Canonie at and adjacent to Site 3. Based on water level measurements taken in November 1990, groundwater flow is generally to the east at a gradient of about 0.006 foot/foot. This is contrary to previous investigations and evidence from the Canonie soil gas survey (Kennedy, 1980; E&E, 1983), suggesting a northwesterly gradient. Groundwater samples were taken from each well and analyzed for VOCs, SVOCs, metals, EDB, and general chemical characteristics.

No VOCs, SVOCs, or EDB were detected in the groundwater samples at Site 3. However, the soil sample analyses suggest the presence of hydrocarbon compounds within the saturated zone. During trench digging in 1985, Wahler reported free product on the trench inflow water west of the site and observed a heavy black oily substance in well OW-6 located south of the site (Wahler, 1985). Product was not reported in the Canonie wells, but it should be noted that these wells are not screened across the water table. If product were present with any areal extent around the wells, a dissolved fraction should have been detected in the water samples.

Fifteen metals are present in the groundwater at concentrations exceeding the 95 percent/95 percent statistical tolerance interval of background concentrations at NAS Alameda (Table 3-3) (PRC/JMM, 1992c). However, six of these metals have an extreme upper concentration that can be found in typical groundwater samples; with the exception of vanadium, the concentrations at Site 3 are within those extreme upper limits (Table 3-4). The concentrations of zinc in the groundwater samples exceed the background limit but do not exceed the typical concentration limit. All three samples were generally similar in their number of metals with elevated concentrations.

If the analytical results can be validated and are considered to be acceptable, the following conclusions can be made:

- VOCs, SVOCs, and EDB were not detected in the groundwater at Site 3. However, both soil gas and soil analyses results suggest the potential for groundwater at the site to be impacted by these chemicals. Additional groundwater well(s) are required to evaluate the TPH in the groundwater to the west and northwest.
- The groundwater flow direction is not adequately defined at the site; therefore, additional monitoring is necessary to characterize the local groundwater flow in order to sufficiently evaluate the existing data.
- Metals are present in the groundwater at concentrations exceeding the 95 percent/95 percent statistical tolerance interval for NAS Alameda. Additional data are required to characterize the groundwater quality at this site.
- Additional TDS data are required to evaluate whether groundwater beneath the site is considered as potential drinking water.
- At present, no information is available to evaluate the tidal influence on groundwater and the deeper groundwater-bearing zone. Additional work is required to evaluate the tidal influence and the deeper groundwater-bearing zone.

The significance of the presence of these VOCs, SVOCs, EDB, and metals in groundwater will be further evaluated during the risk assessment to be performed during the comprehensive RI/FS work.

TABLE 7-1

SITE 3 - AREA 97, ABANDONED FUEL STORAGE AREA
SUMMARY OF LABORATORY ANALYSES PERFORMED ON SOIL AND GROUNDWATER SAMPLES
 (Sheet 1 of 2)

Boring	Depth	Matrix	Alkalinity/Acidity	Ammonia	Ammonium	Asbestos (Tot)	Ash (Tot)	SVOC	BTU Value	Cations/Anions	CEC	Cyanide (Tot)	DO (Tot)	EDB	Herb Uniq	Herbicides	Mercury	Metals	Pes/PCB	pH	Phosphorous	Potassium	Radiation	Spec. Con.	Kjeldahl Nitrogen	TOC	TRPH	TRPH/Oil&Grease	TSTDS	VOC
MW97-1	1.5-2.0	Soil				.										.									.					
MW97-1	2.5-3.0	Soil										.																		.
MW97-1	3.0-3.5	Soil				.										.									.					
MW97-1	4.0-4.5	Soil		.	.		.												.				.	.
MW97-1	5.0-5.5	Soil										.																		.
MW97-1	7.0-7.5	Soil				.										.									.					.
MW97-1	8.0-8.5	Soil										.																		.
MW97-1	10.5-11.0	Soil				.										.									.					.
MW97-1	11.5-12.0	Soil										.													.					.
MW97-1	14.0-14.5	Soil				.										.									.					.
MW97-1	14.5-15.0	Soil														.									.					.
MW97-1R	11.0-11.5	Soil				.						.				.									.					.
MW97-2	1.0-1.5	Soil				.										.									.					.
MW97-2	2.0-2.5	Soil				.						.													.					.
MW97-2	3.5-4.0	Soil				.										.			.					.	.	.				.
MW97-2	4.0-4.5	Soil		.	.		.												.		.			.	.	.				.
MW97-2	5.0-5.5	Soil										.																		.
MW97-2	7.0-7.5	Soil				.										.									.					.
MW97-2	8.0-8.5	Soil										.													.					.
MW97-2	11.0-11.5	Soil				.										.									.					.
MW97-2	11.5-12.0	Soil										.													.					.
MW97-2	14.0-14.5	Soil				.										.									.					.
MW97-2	14.5-15.0	Soil														.									.					.
MW97-2R	7.5-8.0	Soil														.									.					.
MW97-3	0.5-1.0	Soil				.										.									.					.
MW97-3	2.0-2.5	Soil										.													.					.
MW97-3	3.5-4.0	Soil				.										.			.					.	.	.				.
MW97-3	4.0-4.5	Soil		.	.		.												.		.			.	.	.				.

TABLE 7-1

SITE 3 - AREA 97, ABANDONED FUEL STORAGE AREA
SUMMARY OF LABORATORY ANALYSES PERFORMED ON SOIL AND GROUNDWATER SAMPLES
 (Sheet 2 of 2)

Boring	Depth	Matrix	Alkalinity/Acidity	Ammonia	Ammonium	Asbestos (Tox)	Ash (Tot)	SVOC	BTU Value	Cations/Anions	CEC	Cyanide (Tot)	DO (Tot)	EDB	Herb Uniq	Herbicides	Mercury	Metals	Pest/PCB	pH	Phosphorous	Potassium	Radiation	Spec. Con.	Kjeldahl Nitrogen	TOC	TRPH	TRPH/Oil&Grease	TS/TDS	VOC
MW97-3	5.0-5.5	Soil											•																	•
MW97-3	7.0-7.5	Soil					•										•									•				•
MW97-3	8.0-8.5	Soil											•																	•
MW97-3	10.5-11.0	Soil					•										•									•				•
MW97-3	11.5-12.0	Soil											•																	•
MW97-3	14.0-14.5	Soil					•										•									•				•
MW97-3	14.5-15.0	Soil																												•
MW97-3R	11.0-11.5	Soil															•													•
Summary Soil			3		3	16	3					13				18		3	4					3	3	16			17	
222	0.0	Water																												•
223	0.0	Water																												•
225	0.0	Water																												•
226	0.0	Water																												•
MW97-1	0.0	Water	•				•					•	•				•		•				•		•		•	•		•
MW97-2	0.0	Water	•				•					•	•				•		•				•		•		•	•		•
MW97-3	0.0	Water	•				•					•	•				•		•				•		•		•	•		•
Summary Water			3			3						3	3			3		3				3		3		3	3		7	

Notes:

200 series boring numbers are travel blanks

Analysis	Methods	Matrix
Misc		
Phosphorus	ASA #9 24-2.3	soil
TKN	ASA #9 31-3	soil
TDS	EPA 160.1	water
Nitrate	EPA 300.0	soil
Chloride	EPA 300.0 (Mod)	soil
Acidity	EPA 305.1	water
Alkalinity	EPA 310.1	water

Analysis	Methods	Matrix
Misc (cont.)		
Alkalinity	EPA SM403	water
Ammonium	EPA/CE81	soil
Hardness	SM 314A	water
BTU	ASTM D3286-73	soil
DO	DO	water
Spec Con	EPA 120.1	water
TRPH	EPA 418.1	soil

Analysis	Methods	Matrix
EDB	EPA 504	soil
Metals	EPA 6010	soil
Metals	EPA 200.7	water
VOC	EPA 624	water
VOC	EPA 8240	soil
SVOC	EPA 8270	soil
pH	EPA 9045	water
Ash	EPA SM302H	soil

TABLE 7-2

**SITE 3 - AREA 97, ABANDONED FUEL STORAGE AREA
GEOTECHNICAL SAMPLE LABORATORY TEST RESULTS**

Sample No.	Depth (ft)	Soil Classification		Moisture Content (%)	Dry Density (pcf)	Specific Gravity	Hydraulic Conductivity (cm/s)
		Labotatory	Field				
MW97-2	6.5	NA	CL	26.6	196.1	NA	NA
MW97-3	1	SM	SM	NA	NA	NA	NA
MW97-3	12.5	SM	SC	NA	NA	NA	NA

Notes:

NA - Not Analyzed

Parameters not detectect are reported as less than method detection limit.

Laboratory Methods (Units):

Soil Classification - Unified Soil Classification System (USCS) - ASTM D2488

Moisture Content - ASTM D2216 (percent)

Dry Density - ASTM D2937 (pounds per cubic foot)

Specific Gravity - ASTM D854

Hydraulic Conductivity - EPA 9100 (centimeters per second)

Soil Classification Legend:

GW	Well graded gravels, gravel-sand mixtures, little or no fines	SM	Silty sands, sand-silt mixtures
		SC	Clayey sands, sand-clay mixtures
GP	Poorly graded gravels, gravel-sand mixtures, little or no fines	ML	Inorganic silts and very fine sands, rock flow silty or clayey fine sands or clayey silts with slight plasticity
GM	Silty gravels, gravel-sand-silt mixtures		
GC	Clayey gravels, gravel-sand-clay mixtures	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
SW	Well graded sands, gravelly sands, little or no fines		
		OL	Organic silts and organic silty clays or low plasticity
SP	Poorly-graded sands, gravelly sands, little or no fines	CH	Inorganic clays of high plasticity, fat clays

TABLE 7-3
SITE 3-AREA 97-ABANDONED FUEL STORAGE AREA
SOIL GAS SURVEY RESULTS
(Sheet 1 of 5)

Sample Location/ Probe Depth (feet)	Concentration (µg/L)				
	Benzene	Toluene	Ethyl Benzene	Xylene	Total Hydrocarbons
A1-2	<0.04	<0.05	<0.06	<0.08	<0.06
A2-4	<0.04	<0.05	<0.06	<0.08	<0.06
A3-4	<0.04	<0.05	<0.06	<0.08	<0.06
A4-3	<0.04	<0.05	<0.06	<0.07	<0.05
A5-3	<0.04	<0.05	<0.06	<0.07	<0.05
A6-3	<0.04	<0.05	<0.06	<0.07	<0.05
A7-5	0.4	0.4	<0.06	<0.07	12
A8-4	0.8	4	<0.1	<0.1	16
A9-5	1	42	0.3	8	80
A11-2	0.2	6	<0.1	<0.1	12
A12-6	<4	<4	<5	<6	54000
A13-2	<0.08	0.7	<0.1	<0.1	980
A14-2	<0.4	<0.4	<0.5	<0.6	6900
A15-4	<0.3	<0.4	<0.4	<0.4	6700
B1-4	<0.04	<0.05	<0.06	<0.08	<0.06
B2-4	<0.04	<0.05	<0.06	<0.08	<0.06
B3-5	0.2	0.1	<0.06	<0.08	0.8
B4-4	<0.04	<0.05	<0.06	<0.07	<0.05
B5-5	0.3	0.2	<0.05	<0.06	8
B6-5	2	12	<0.05	<0.06	34
B7-5	8900	22000	<50	<57	190000
B8-5	9150	23626	<50	<57	200000
B9-5	22000	24000	<50	<57	248000
B10-3	0.04	0.04	<0.05	<0.06	0.4
B11-5	<0.04	3	<0.05	<0.06	7
B12-5	<0.04	<0.04	<0.05	<0.06	<0.05
B13-4	0.3	0.4	0.1	<0.06	6
B14-2	<0.4	110	1	10	9000
B15-3	<0.04	<0.04	<0.05	<0.06	<0.05

TABLE 7-3

**SITE 3-AREA 97-ABANDONED FUEL STORAGE AREA
SOIL GAS SURVEY RESULTS
(Sheet 2 of 5)**

Sample Location/ Probe Depth (feet)	Concentration ($\mu\text{g/L}$)				
	Benzene	Toluene	Ethyl Benzene	Xylene	Total Hydrocarbons
C1-3	0.3	<0.05	<0.06	<0.08	6
C2-4	<0.04	<0.05	<0.06	<0.08	<0.06
C3-6	<0.04	<0.05	<0.06	<0.08	<0.06
C4-4	0.2	0.5	0.06	0.04	8
C5-5	26000	47000	420	64	230000
C6-5	36000	29000	500	22	400000
C7-5	25000	34000	56	48	540000
C8-5	47000	26000	<56	<64	960000
C10-3	2	7	<0.06	<0.06	26
C11-4	<0.04	<0.04	<0.05	<0.06	<0.05
C12-3	<0.04	<0.04	<0.05	<0.06	16
C13-2	<0.08	<0.09	<0.1	<0.1	3600
C14-4	<0.8	<0.09	<1	<1	20000
D1-2	0.1	<0.05	<0.06	0.08	0.6
D2-5	0.09	<0.05	<0.06	<0.08	0.4
D3-5	0.1	<0.05	<0.06	<0.08	0.6
D5-4	0.4	<0.05	<0.06	<0.07	4
D6-5	17000	30000	42	100	160000
D7-5	29000	51000	56	64	660000
D8-5	9200	13000	<52	<60	163000
D9-3	<0.8	<0.09	<0.1	<0.1	<0.1
D9-5	73000	29000	1000	440	810000
D10-3	<0.04	<0.04	<0.05	<0.06	<0.05
D11-4	<0.4	48	<0.5	<0.6	1600
D14-2	<0.08	0.2	<0.1	<0.1	24
E1-3	<0.04	<0.05	<0.06	<0.08	<0.06
E2-4	<0.04	<0.05	<0.06	<0.08	<0.06
E3-5	<0.04	<0.05	<0.06	<0.08	<0.06
E4-4	<0.04	<0.05	<0.05	<0.06	<0.05

TABLE 7-3

**SITE 3-AREA 97-ABANDONED FUEL STORAGE AREA
SOIL GAS SURVEY RESULTS
(Sheet 3 of 5)**

Sample Location/ Probe Depth (feet)	Concentration (µg/L)				
	Benzene	Toluene	Ethyl Benzene	Xylene	Total Hydrocarbons
E5-5	<0.04	<0.05	<0.05	<0.06	<0.05
E6-5	8	74	0.6	0.8	170
E7-5	37000	26000	<28	<13	460000
E8-5	17000	36000	23	310	190000
E9-5	14000	35000	21	230	220000
E10-3	55	60	<6	<6	1300
E12-3	220	520	<6	<6	810
E13-2	0.008	0.09	0.1	0.1	0.7
F1-2	<0.04	<0.05	<0.06	<0.08	<0.06
F2-5	<0.04	<0.05	<0.06	<0.08	0.2
F3-4	0.06	0.07	0.8	2	93
F4-4	<0.04	<0.05	<0.05	<0.06	<0.05
F5-5	<0.04	<0.05	<0.05	<0.06	<0.05
F6-5	<0.04	<0.05	NT	<0.07	<0.05
F7-5	<0.04	<0.05	<0.06	<0.06	<0.05
F8-5	35000	58000	67	510	350000
F9-4	1	0.07	<0.06	<0.06	NT
F10-4	0.08	0.09	<0.01	<0.1	1
F11-3	1	0.76	<0.06	<0.06	19
F13-3	<0.04	<0.05	<0.06	<0.06	<0.05
F14-4	<0.04	<0.05	<0.06	<0.06	<0.05
F15-3	<0.04	<0.05	<0.06	<0.06	<0.05
G1-4	0.09	0.2	0.5	<0.08	1
G2-5	0.2	<0.05	<0.06	<0.08	0.4
G6-5	16	4	<0.09	<0.09	60
G7-5	<0.04	<0.05	<0.05	<0.06	<0.05
G8-5	<0.04	<0.05	<0.05	<0.06	0.09
G9-3	<0.04	<0.05	<0.06	<0.06	0.1
G10-4	<0.04	<0.05	<0.06	<0.06	<0.05

TABLE 7-3

SITE 3-AREA 97-ABANDONED FUEL STORAGE AREA
SOIL GAS SURVEY RESULTS
(Sheet 4 of 5)

Sample Location/ Probe Depth (feet)	Concentration (µg/L)				Total Hydrocarbons
	Benzene	Toluene	Ethyl Benzene	Xylene	
G11-5	0.2	<0.05	<0.06	<0.06	2
G13-5	<0.04	<0.05	<0.05	<0.06	0.2
H1-5	0.08	0.6	<0.05	<0.06	1
H2-5	0.04	<0.05	<0.06	<0.08	0.2
H3-6	0.08	<0.05	<0.06	<0.07	0.1
H4-5	0.2	<0.05	<0.06	<0.07	1
H5-5	0.6	<0.05	<0.06	<0.07	1
H6-5	<0.04	<0.05	<0.06	<0.07	20
H7-5	<0.04	<0.05	<0.06	<0.06	0.05
H8-5	0.3	<0.05	<0.06	<0.06	0.4
H9-3	0.2	0.09	<0.06	<0.06	1
H10-4	<0.04	<0.04	<0.05	<0.06	<0.05
H11-4	0.2	<0.05	<0.06	<0.06	0.3
H12-5	0.04	<0.05	<0.06	<0.06	0.3
H13-5	<0.04	<0.05	<0.06	<0.06	<0.05
I1-4	<0.04	<0.05	<0.06	<0.08	0.1
I2-4	<0.04	<0.05	<0.06	<0.08	<0.06
I5-4	<0.04	<0.05	<0.06	<0.07	0.1
I5-5	2	23	48	100	6900
I7-5	<0.04	<0.05	<0.05	<0.06	<0.05
J1-5	3200	2600	88	300	14000
J2-5	<0.04	<0.05	<0.06	<0.08	<0.06
J3-4	<0.04	<0.05	<0.06	<0.07	<0.05
J4-4	<0.04	<0.05	<0.06	<0.07	<0.05
J5-5	<0.04	<0.05	<0.06	<0.07	0.4
J6-5	<0.04	<0.05	<0.06	<0.06	0.1
J7-5	<0.04	<0.05	<0.06	<0.06	<0.05

TABLE 7-3
SITE 3-AREA 97-ABANDONED FUEL STORAGE AREA
SOIL GAS SURVEY RESULTS
(Sheet 5 of 5)

Sample Location/ Probe Depth (feet)	Concentration ($\mu\text{g/L}$)				
	Benzene	Toluene	Ethyl Benzene	Xylene	Total Hydrocarbons
K1-5	<0.04	<0.05	<0.06	<0.08	<0.06
K2-5	<0.04	<0.05	<0.06	<0.08	<0.06
K3-5	<0.04	<0.05	<0.06	<0.07	<0.05
K4-5	<0.04	<0.05	<0.06	<0.07	<0.05
K5-4	<0.04	<0.05	<0.06	<0.07	<0.05
K7-5	<0.04	<0.05	<0.06	<0.07	<0.05
K8-5	<0.04	<0.05	<0.06	<0.07	<0.05

Notes:

< X denotes the analyte was not detected to a level of X.

NT denotes the analyte was not tested at that location.

TABLE 7-4

**SITE 3 - AREA 97, ABANDONED FUEL STORAGE AREA
RESULTS FOR VOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES**

Parameter Reported	MW97-1 07/26/90 2.5-3 ft	MW97-1 07/26/90 5-5.5 ft	MW97-1 07/26/90 8-8.5 ft	MW97-1 07/26/90 11.5-12 ft	MW97-1 07/26/90 14.5-15 ft	MW97-2 07/26/90 2-2.5 ft	MW97-2 07/26/90 5-5.5 ft
Methylene Chloride (ug/kg)	<6.00	7	29	17	16	11	28
Acetone (ug/kg)	<12.0	13	<21.0	28	15	17	200
Carbon Disulfide (ug/kg)	<6.00	<6.00	<10.0	<6.00	<6.00	<6.00	15
Toluene (ug/kg)	6	15	32	<6.00	10	6	130
Parameter Reported	MW97-2 07/26/90 8-8.5 ft	MW97-2 07/26/90 11.5-12 ft	MW97-2 07/26/90 14.5-15 ft	MW97-3 07/26/90 2-2.5 ft	MW97-3 07/26/90 5-5.5 ft	MW97-3 07/26/90 8-8.5 ft	MW97-3 07/26/90 11.5-12 ft
Methylene Chloride (ug/kg)	11	11	16	13	9	22	11
Acetone (ug/kg)	32	39	15	<11.0	22	70	26
Carbon Disulfide (ug/kg)	<6.00	<6.00	<5.00	<5.00	<7.00	<9.00	<6.00
Toluene (ug/kg)	110	46	<5.00	26	11	50	10
Parameter Reported	MW97-3 07/26/90 14.5-15 ft						
Methylene Chloride (ug/kg)	11						
Acetone (ug/kg)	15						
Carbon Disulfide (ug/kg)	<6.00						
Toluene (ug/kg)	11						

Notes: NA = Not Analyzed
 < = Detection Limit
 ug/kg = micrograms per kilogram
 Data not validated by JMM

TABLE 7-5

**SITE 3 - AREA 97, ABANDONED FUEL STORAGE AREA
RESULTS FOR SEMIVOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES**

Parameter Reported	MW97-3 07/26/90 10.5-11 ft
Pyrene (ug/kg)	3100
Benzo(g,h,i)perylene (ug/kg)	1600

Notes: NA = Not Analyzed
 < = Detection Limit
 ug/kg = micrograms per kilogram
 Data not validated by JMM

TABLE 7-6

SITE 3 - AREA 97, ABANDONED FUEL STORAGE AREA
RESULTS FOR TOTAL RECOVERABLE PETROLEUM HYDROCARBONS DETECTED IN SOIL SAMPLES

Parameter Reported	MW97-1 07/26/90 7-7.5 ft	MW97-1 07/26/90 14-14.5 ft	MW97-2 07/26/90 1-1.5 ft	MW97-2 07/26/90 3.5-4 ft	MW97-2 07/26/90 7-7.5 ft	MW97-3 07/26/90 0.5-1 ft	MW97-3 07/26/90 3.5-4 ft
TRPH (mg/kg)	129	4.9	19.3	28.7	93.8	133	25.8

Parameter Reported	MW97-3 07/26/90 7-7.5 ft	MW97-3 07/26/90 10.5-11 ft
TRPH (mg/kg)	5.2	31.6

Notes: NA = Not Analyzed
 < = Detection Limit
 mg/kg = milligrams per kilogram
 Data not validated by JMM

TABLE 7-7

**SITE 3 - AREA 97, ABANDONED FUEL STORAGE AREA
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
(Sheet 1 of 3)**

Parameter Reported	MW97-1 07/26/90 1.5-2 ft	MW97-1 07/26/90 3-3.5 ft	MW97-1 07/26/90 7-7.5 ft	MW97-1 07/26/90 10.5-11 ft	MW97-1 07/26/90 14-14.5 ft	MW97-1R 07/26/90 11-11.5 ft	MW97-2 07/26/90 1-1.5 ft
Aluminum (mg/kg)	4270	3820	11800	5850	5430	5280	4440
Arsenic (mg/kg)	<11.0	<12.0	22	<12.0	<12.0	<13.0	<11.0
Barium (mg/kg)	34	31	94	30	34	37	32
Calcium (mg/kg)	2000	20000	4000	1900	3700	1900	2000
Chromium (mg/kg)	25	22	50	25	25	24	27
Cobalt (mg/kg)	<5.40	<5.80	12	<6.10	<6.00	<6.50	<5.50
Copper (mg/kg)	10	<5.80	110	8.4	38	17	6.9
Iron (mg/kg)	8190	7050	25600	6980	8340	7380	7790
Lead (mg/kg)	<5.40	<5.80	44	<6.10	<6.00	<6.50	<5.50
Magnesium (mg/kg)	2200	2100	6800	2500	2300	2600	2400
Manganese (mg/kg)	95	110	290	58	58	61	99
Nickel (mg/kg)	23	24	60	15	23	17	24
Potassium (mg/kg)	670	630	2500	1100	970	1100	700
Sodium (mg/kg)	<540	<580	4000	2800	2800	2900	<550
Titanium (mg/kg)	350	310	440	360	280	380	390
Vanadium (mg/kg)	17	16	43	22	18	22	18
Zinc (mg/kg)	28	18	120	17	23	23	20

Notes: NA = Not Analyzed
 < = Detection Limit
 mg/kg = milligrams per kilogram
 Data not validated by JMM

TABLE 7-7

**SITE 3 - AREA 97, ABANDONED FUEL STORAGE AREA
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
(Sheet 2 of 3)**

Parameter Reported	MW97-2 07/26/90 3.5-4 ft	MW97-2 07/26/90 7-7.5 ft	MW97-2 07/26/90 11-11.5 ft	MW97-2 07/26/90 14-14.5 ft	MW97-2R 07/26/90 7.5-8 ft	MW97-3 07/26/90 0.5-1 ft	MW97-3 07/26/90 3.5-4 ft
Aluminum (mg/kg)	22400	15400	5920	8240	5110	7720	7110
Arsenic (mg/kg)	21	21	<12.0	<12.0	<12.0	<11.0	<11.0
Barium (mg/kg)	260	92	24	39	60	55	35
Calcium (mg/kg)	2500	3500	1000	1100	1500	3100	2400
Chromium (mg/kg)	79	57	27	27	25	35	33
Cobalt (mg/kg)	8.8	14	<5.90	<6.20	<5.90	6.5	6.4
Copper (mg/kg)	61	44	<5.90	<6.20	6.1	18	18
Iron (mg/kg)	31200	33300	9460	13200	5020	13600	15400
Lead (mg/kg)	59	100	<5.90	<6.20	<5.90	22	9.8
Magnesium (mg/kg)	10000	8800	2400	3100	1900	3600	4300
Manganese (mg/kg)	230	420	59	94	55	180	150
Nickel (mg/kg)	66	84	23	39	14	37	34
Potassium (mg/kg)	4100	2900	900	1200	890	1000	1000
Sodium (mg/kg)	6400	4700	2500	3700	2100	<570	<560
Titanium (mg/kg)	670	430	310	400	350	400	360
Vanadium (mg/kg)	57	46	21	21	18	27	26
Zinc (mg/kg)	100	98	16	24	16	60	37

Notes: NA = Not Analyzed
 < = Detection Limit
 mg/kg = milligrams per kilogram
 Data not validated by JMM

TABLE 7-7

**SITE 3 - AREA 97, ABANDONED FUEL STORAGE AREA
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
(Sheet 3 of 3)**

Parameter Reported	MW97-3 07/26/90 7-7.5 ft	MW97-3 07/26/90 10.5-11 ft	MW97-3 07/26/90 14-14.5 ft	MW97-3R 07/26/90 11-11.5 ft
Aluminum (mg/kg)	4340	6720	8230	10400
Arsenic (mg/kg)	<12.0	<12.0	<12.0	<12.0
Barium (mg/kg)	<24.0	33	72	190
Calcium (mg/kg)	1700	2100	1200	1500
Chromium (mg/kg)	24	27	31	45
Cobalt (mg/kg)	<6.10	<5.80	<6.00	7.4
Copper (mg/kg)	11	32	17	7.4
Iron (mg/kg)	8400	9660	13400	16200
Lead (mg/kg)	27	<5.80	<6.00	<6.00
Magnesium (mg/kg)	2200	2400	3000	3300
Manganese (mg/kg)	85	81	100	91
Nickel (mg/kg)	20	23	40	40
Potassium (mg/kg)	830	870	1100	1300
Sodium (mg/kg)	<610	<580	1200	780
Titanium (mg/kg)	320	380	440	480
Vanadium (mg/kg)	17	23	23	35
Zinc (mg/kg)	32	31	30	22

Notes: NA = Not Analyzed
 < = Detection Limit
 mg/kg = milligrams per kilogram
 Data not validated by JMM

TABLE 7-8

**SITE 3 - AREA 97, ABANDONED FUEL STORAGE AREA
RESULTS FOR GENERAL CHEMICAL CHARACTERISTICS IN SOIL SAMPLES**

Parameter Reported	MW97-1 07/26/90 4-4.5 ft	MW97-2 08/27/90 4-4.5 ft	MW97-3 07/26/90 4-4.5 ft
Miscellaneous Measurements			
Ash (%)	95.6	93.1	98.3
Chloride (mg/kg)	29.2	7550	14.8
Exchangeable Ammonium-N (mg/kg)	<25.0	84	<25.0
Nitrate (as Nitrogen) (mg/kg)	<0.120	0.18	2.24
Sulfate (mg/kg)	42.1	1210	89.8
Total Kjeldahl Nitrogen (mg/kg)	174	1400	196
Total Phosphorus (mg/kg)	675	1230	922
Total Organic Carbon			
Total Organic Carbon (mg/kg)	1090	13500	1260
<hr/>			
	MW97-1 07/26/90 3-3.5 ft	MW97-2 07/26/90 3.5-4 ft	MW97-3 07/26/90 3.5-4 ft
Characteristic Measurements			
pH (Units)	9	7.2	7.5

Notes: NA = Not Analyzed
 < = Detection Limit
 mg/kg = milligrams per kilogram
 Data not validated by JMM

TABLE 7-9

**SITE 3 - AREA 97, ABANDONED FUEL STORAGE AREA
RESULTS FOR VOLATILE ORGANIC COMPOUNDS DETECTED IN GROUNDWATER SAMPLES**

	226
	08/31/90
Parameter Reported	0-0 ft
Methylene Chloride (ug/L)	10

Notes: NA = Not Analyzed

< = Detection Limit

ug/L = micrograms per liter

Data not validated by JMM

200-series numbers as well as boring name indicates a travel blank

TABLE 7-10

**SITE 3 - AREA 97, ABANDONED FUEL STORAGE AREA
RESULTS FOR METALS DETECTED IN GROUNDWATER SAMPLES**

Parameter Reported	MW97-1 08/30/90 0-0 ft	MW97-2 08/31/90 0-0 ft	MW97-3 10/18/90 0-0 ft
Aluminum (mg/L)	77	47	40
Barium (mg/L)	0.58	0.33	0.37
Calcium (mg/L)	113	261	150
Chromium (mg/L)	0.25	0.12	0.12
Cobalt (mg/L)	0.05	<0.050	<0.050
Copper (mg/L)	0.1	0.044	0.059
Iron (mg/L)	95	67	54
Magnesium (mg/L)	156	825	58
Manganese (mg/L)	1.8	2.7	2.2
Nickel (mg/L)	0.24	0.15	0.15
Potassium (mg/L)	100	236	31
Selenium (mg/L)	0.054	<0.050	<0.050
Sodium (mg/L)	2150	7525	199
Thallium (mg/L)	<0.050	0.055	<0.050
Titanium (mg/L)	2.7	1.8	1.5
Vanadium (mg/L)	0.22	0.11	0.11
Zinc (mg/L)	0.19	0.11	0.14

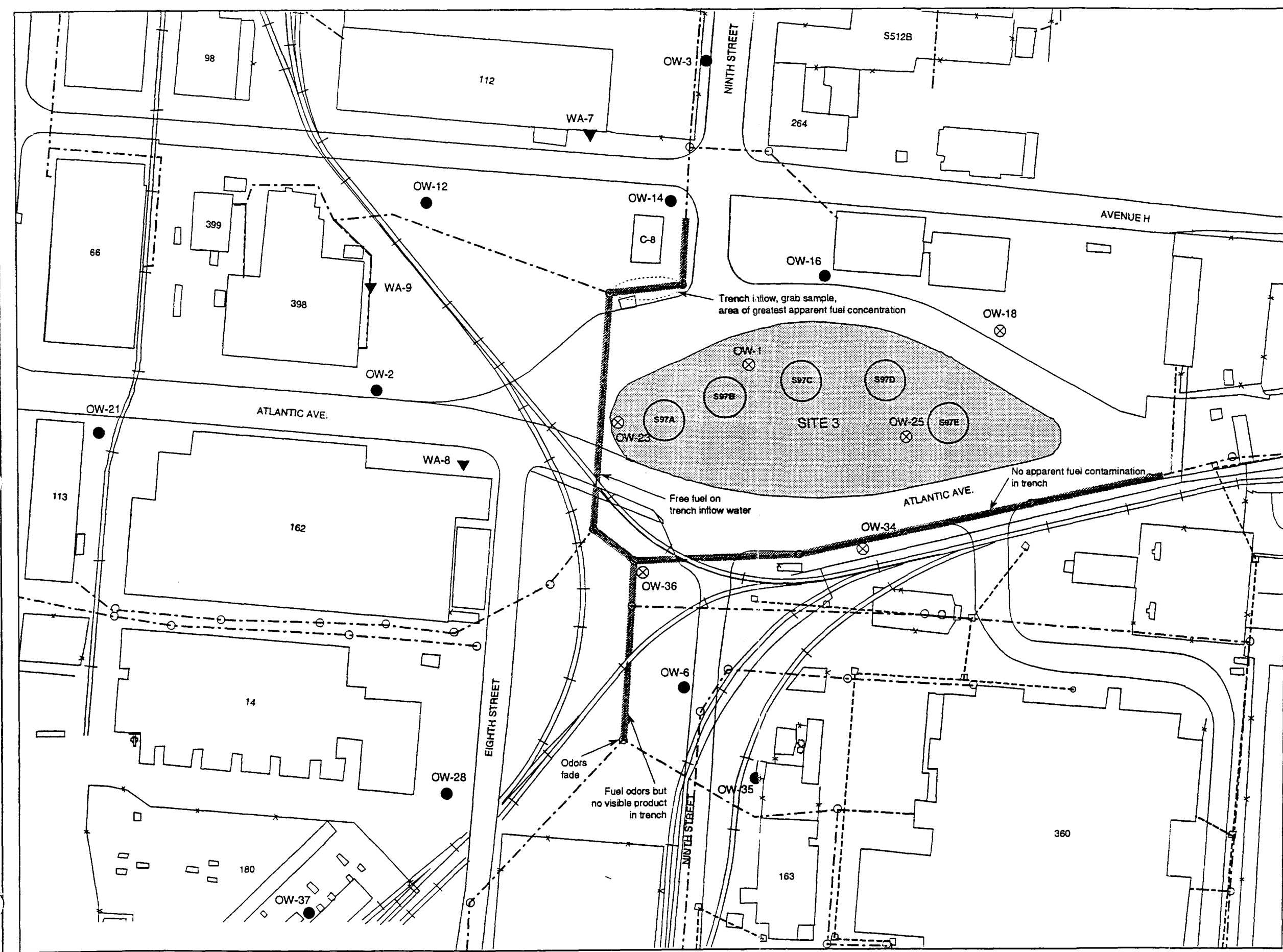
Notes: NA = Not Analyzed
 < = Detection Limit
 mg/L = milligrams per liter
 Data not validated by JMM

TABLE 7-11

**SITE 3 - AREA 97, ABANDONED FUEL STORAGE AREA
RESULTS FOR GENERAL CHEMICAL CHARACTERISTICS IN GROUNDWATER SAMPLES**

Parameter Reported	MW97-1 08/30/90 0-0 ft	MW97-2 08/31/90 0-0 ft	MW97-3 10/18/90 0-0 ft
Miscellaneous Measurements			
Alkalinity, bicarb (as CaCO ₃) (mg/L)	1550	2430	410
Alkalinity, total (as CaCO ₃) (mg/L)	1550	2430	410
Total Dissolved Solids (mg/L)	6440	22300	1280
Total Hardness (as CaCO ₃) (mg/L)	920	4050	614
Total Organic Carbon			
Total Organic Carbon (mg/L)	53.8	79.5	11
Characteristic Measurements			
Dissolved Oxygen (mg/L)	5.4	3.2	7
pH (Units)	7.4	6.8	7.1
Cations/Anions			
Specific Conductance (umhos/cm)	11300	36000	2000

Notes: NA = Not Analyzed
 < = Detection Limit
 mg/L = milligrams per liter
 umhos/cm = micromhos per centimeter
 Data not validated by JMM

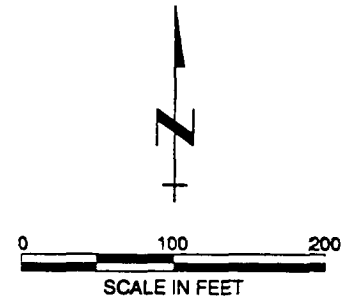


LEGEND:

- ✕ Fence
- Sanitary Sewer Line
- Storm Sewer Line
- ≡ Railroad
- Manhole
- ▬ Trench
- Catch Basin
- ▼ Wahler Well
- Kennedy Well (Found by Wahler)
- ⊗ Kennedy Well (Not Found by Wahler)
- S97A Former Fuel Storage Tank

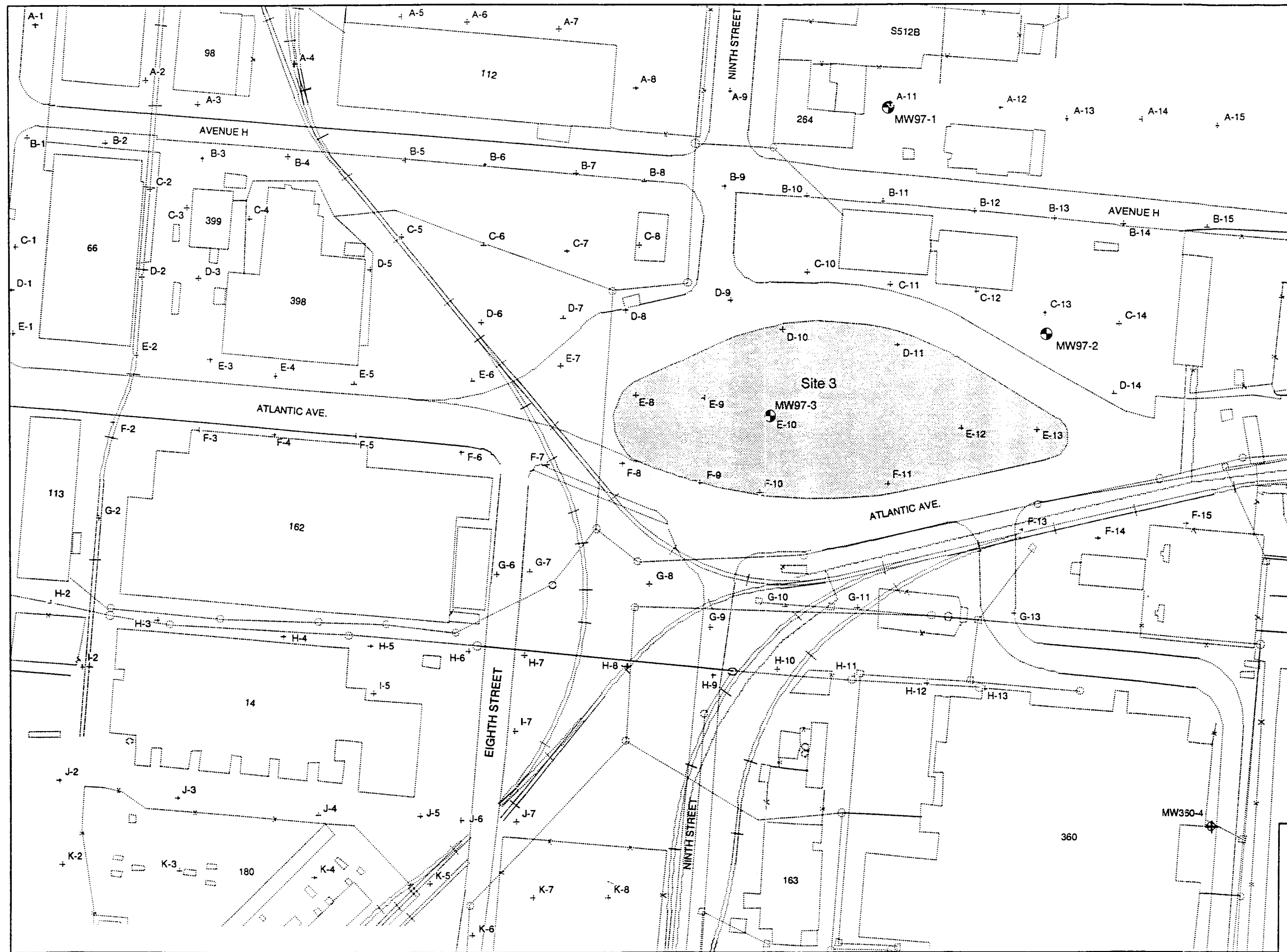
NOTES:
 Boring and monitoring well locations were obtained from a base map provided by Canonie Environmental, Inc. The individual locations were digitized onto a base map CAD file provided by NAS Alameda.

Trench location and comments, Kennedy and Wahler monitoring well locations approximated from Wahler Associates, Figure 6, May, 1985. Storage tank locations approximated from Canonie (1991).



NAVAL AIR STATION ALAMEDA
 ALAMEDA, CALIFORNIA
SITE 3 - AREA 97,
ABANDONED FUEL STORAGE AREA
KENNEDY AND WAHLER TRENCH AND
MONITORING WELL LOCATIONS

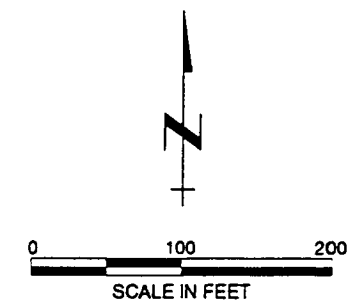
FIGURE 7-1



LEGEND

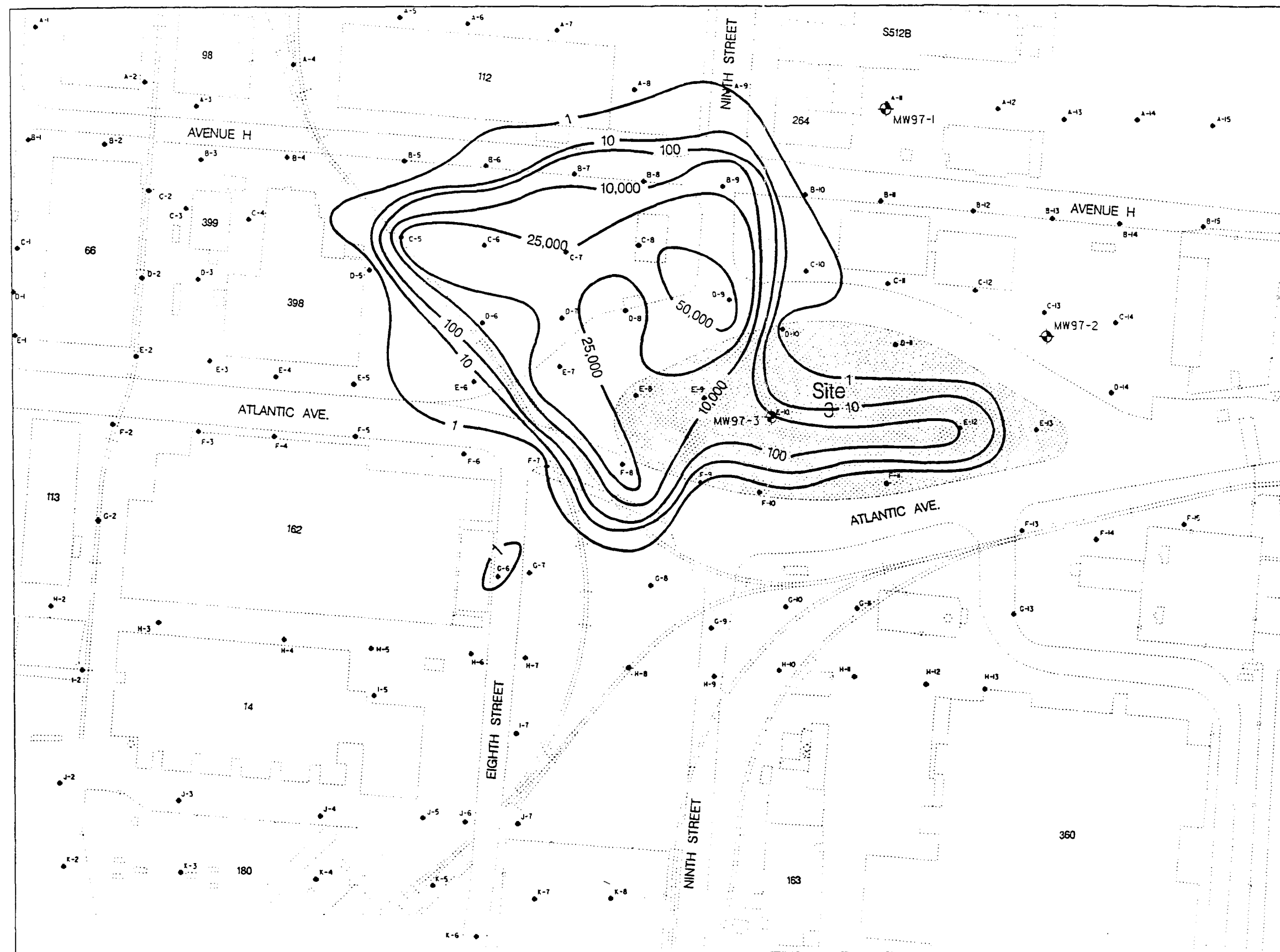
- Canonie Monitoring Well Location
- Canonie Soil Gas Survey Point
- Fence
- Sanitary Sewer Line
- Storm Sewer Line
- Railroad
- Manhole
- Catch Basin




NOTE: Boring and monitoring well locations were obtained from a base map provided by Canonie Environmental, Inc. The individual locations were digitized onto a base map CAD file provided by NAS Alameda.



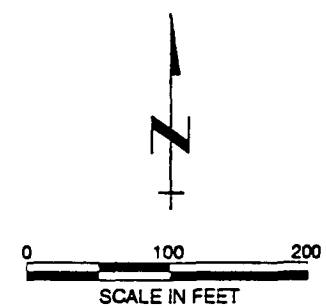
NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
SITE 3 - AREA 97,
ABANDONED FUEL STORAGE AREA
SOIL GAS SURVEY POINTS AND
MONITORING WELL LOCATIONS

FIGURE 7-2



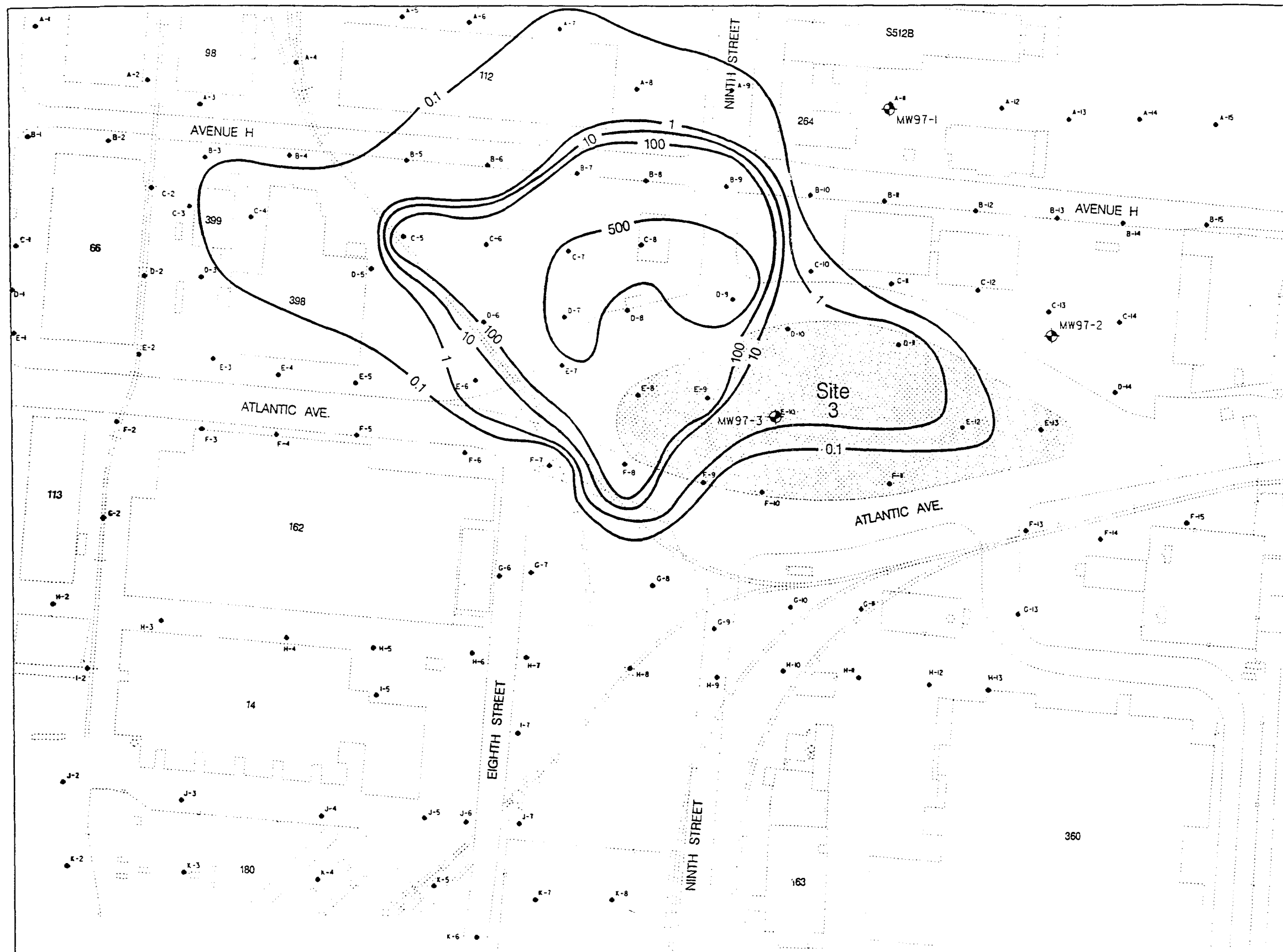
- LEGEND:**
-  Canonie Monitoring Well Location
 -  Canonie Soil Gas Survey Point
 -  Benzene Concentration (µg/L)

NOTE:
 Boring and monitoring well locations were obtained from a base map provided by Canonie Environmental, Inc. The individual locations were digitized onto a base map CAD file provided by NAS Alameda.



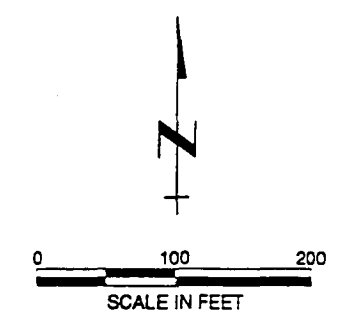
NAVAL AIR STATION ALAMEDA
 ALAMEDA, CALIFORNIA
SITE 3 - AREA 97,
ABANDONED FUEL STORAGE AREA
BENZENE CONCENTRATIONS FROM
SOIL GAS SURVEY

FIGURE 7-4



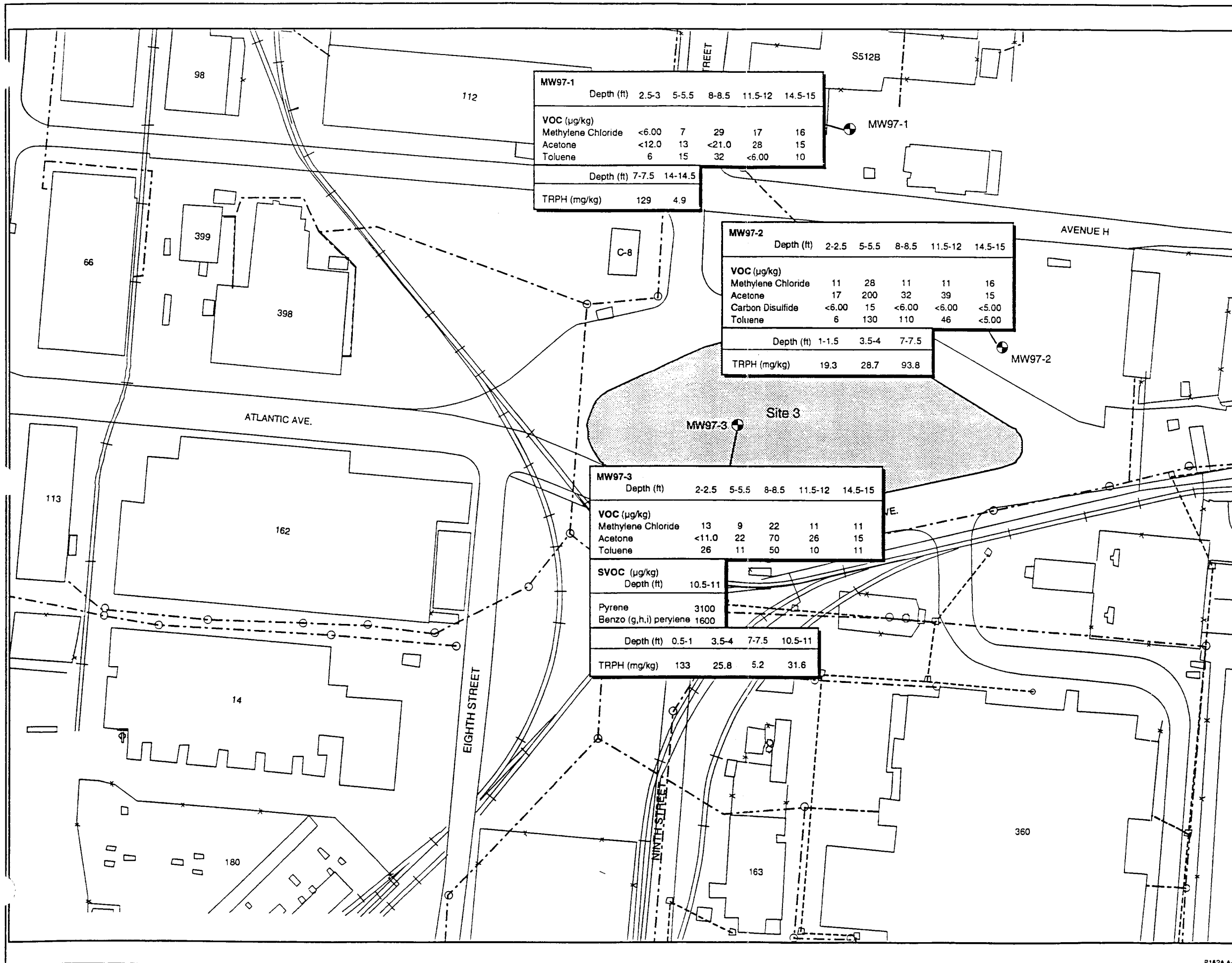
- LEGEND:**
- ⊕ Canolie Monitoring Well Location
 - Canolie Soil Gas Survey Point
 - 0.1- THC Concentration (mg/L)

NOTE:
 Boring and monitoring well locations were obtained from a base map provided by Canolie Environmental, Inc. The individual locations were digitized onto a base map CAD file provided by NAS Alameda.



NAVAL AIR STATION ALAMEDA
 ALAMEDA, CALIFORNIA
SITE 3 - AREA 97,
ABANDONED FUEL STORAGE AREA
THC CONCENTRATIONS FROM
SOIL GAS SURVEY

FIGURE 7-5



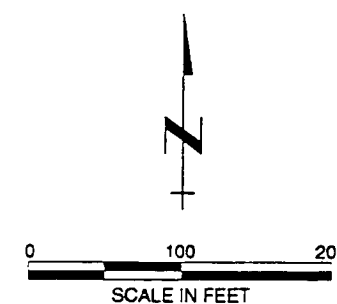
LEGEND:

- Canone Monitoring Well Location
- ✕ Fence
- Sanitary Sewer Line
- Storm Sewer Line
- ⊢ Railroad
- Manhole
- Catch Basin

NOTES:

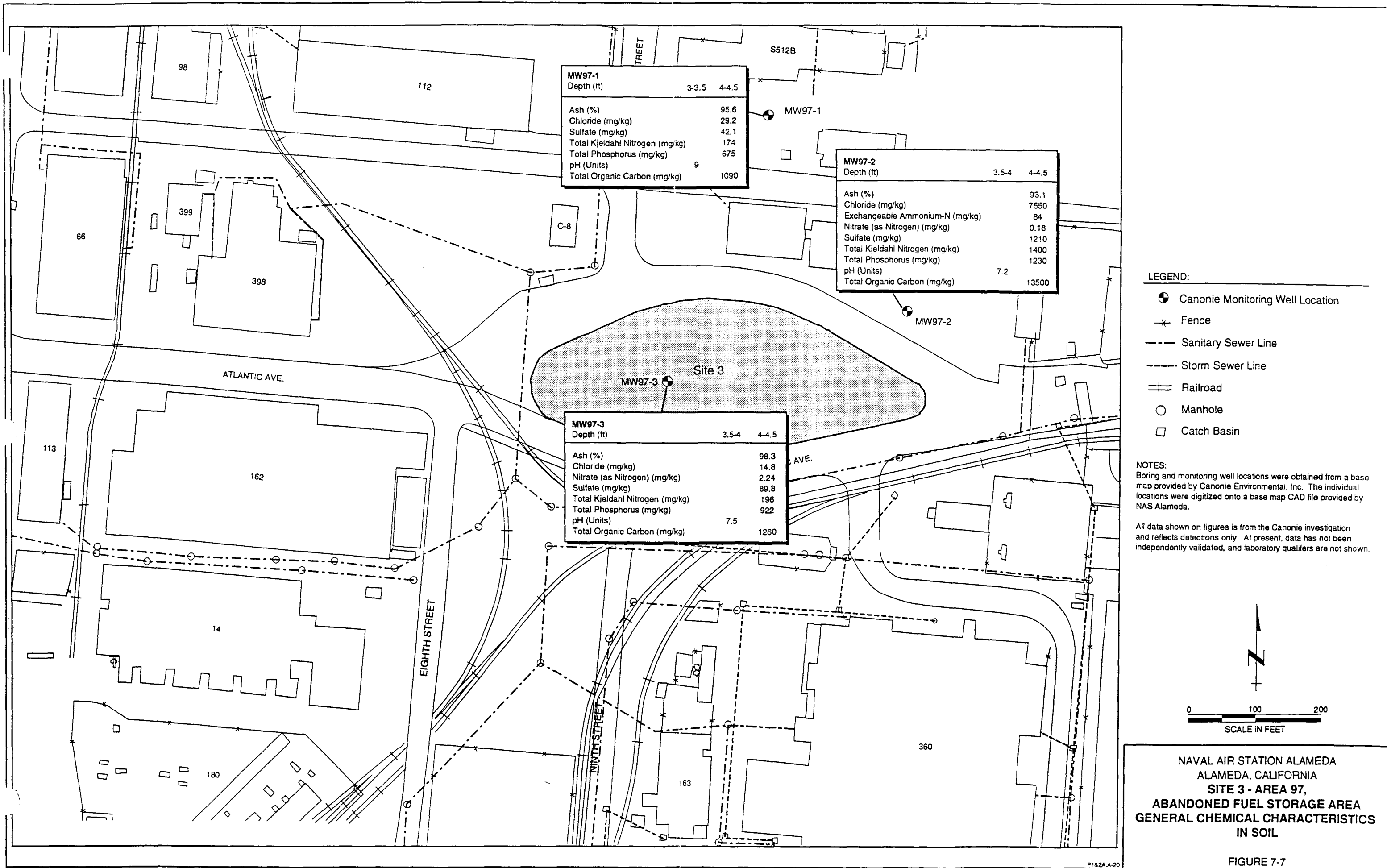
Boring and monitoring well locations were obtained from a base map provided by Canone Environmental, Inc. The individual locations were digitized onto a base map CAD file provided by NAS Alameda.

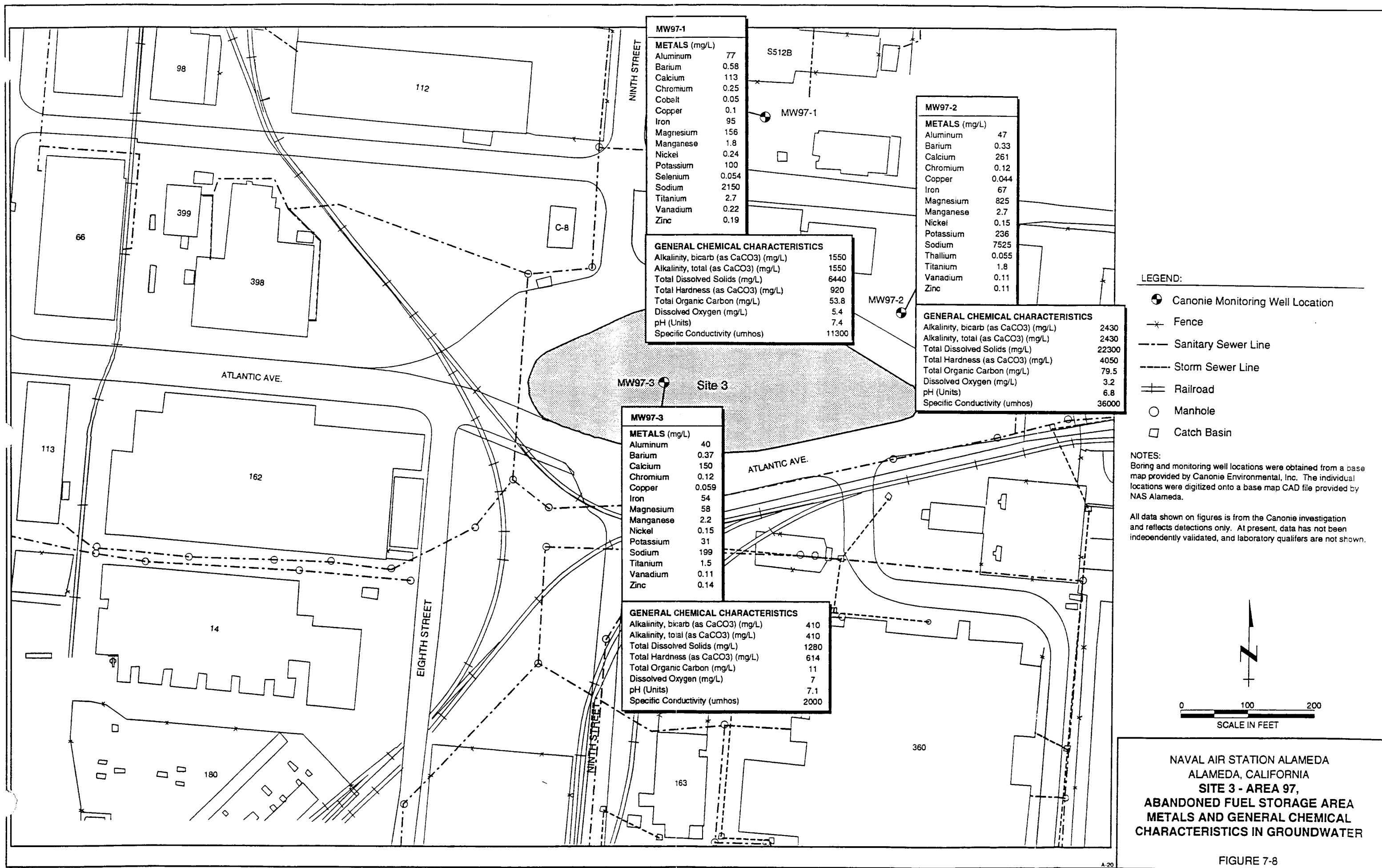
All data shown on figures is from the Canone investigation and reflects detections only. At present, data has not been independently validated, and laboratory qualifiers are not shown.



NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
SITE 3 - AREA 97,
ABANDONED FUEL STORAGE AREA
VOLATILE AND SEMIVOLATILE
ORGANIC COMPOUNDS AND TRPH IN SOIL

FIGURE 7-6





8.0 SITE 4 - BUILDING 360, AIRCRAFT ENGINE FACILITY

8.1 SITE DESCRIPTION AND BACKGROUND

Site 4 (Initial Assessment Study Site 7) consists of Building 360 located near the eastern perimeter of the base on Eleventh Street, approximately 350 feet southwest of the East Gate (Figure 1-2). The building occupies approximately 4.5 acres and houses specialized production shops for the repair and testing of both jet turbine and propeller aircraft engines. A paint shop, a parts cleaning shop, a plating shop, and machine shops are contained in Building 360. The aircraft engine repair operations have been ongoing at the site since 1954 (Canonie, 1990d). Soil and groundwater beneath the plating shop area were investigated and reported in the PRC team's Phases 2B and 3 data summary report (1992a). Canonie's Phases 1 and 2A investigation, reported herein, was focused on the exterior perimeter of the building.

Processes in the former plating shop included paint stripping by blasting; chrome, silver, and nickel stripping; etching; and chrome, silver, nickel, and copper plating. Process in the cleaning and blasting shop use baths of phenolic-based cleaners, alkaline-type cleaners, rust removers, descaling compounds and caustics. Prior to 1975, wastes from the shops were directly discharged to the Seaplane Lagoon via the industrial waste sewer system. Paint sludges and spent degreasing agents were routinely disposed of in the West Beach Landfill (Canonie, 1990d). Since 1975, wastes have been treated at a central pretreatment facility prior to discharge to the East Bay Municipal Utility District (EBMUD) sewage treatment facility in Oakland. Water from the cleaning shop vats is collected and disposed of off-base (Canonie, 1990d).

8.2 CURRENT USE

Building 360 is currently used as an aircraft engine repair and testing facility. Machine shops, stripping and painting shops, and parts assembly areas are still in use. As previously mentioned, plating activities have ceased at Site 4, and the plating shop will be dismantled in the future.

8.3 OTHER INVESTIGATIONS

Two previous environmental studies have been conducted at the plating shop inside Building 360. In 1982 and 1983, Environmental Research Group, Inc. (ERG) collected 19 surface soil samples from beneath the plating shop for chemical analysis. In 1992, as part of the Phases 2B and 3 investigations, the PRC team conducted further sampling of the soil beneath the plating shop, collecting 20 surface soil samples, 9

groundwater samples, and 2 wipe samples from horizontal surfaces inside the plating shop. Summaries of each investigation are presented below.

8.3.1 ERG Plating Shop Sampling

ERG conducted two rounds of surface soil sampling in the crawl space beneath the Building 360 plating shop; the first was on August 6, 1982 and the second was on July 13, 1983.

Ten soil samples were collected in the August 6, 1982, round of sampling; the exact locations of the sampling points are unknown, but based upon sketch maps provided to JMM they are inferred to be near the waste lines in the southwestern corner of the shop. Eight soil samples were analyzed for pH and cyanide. Two were analyzed for various elements, anions, and organic compounds. Cyanide was detected in three of the ten samples with a maximum concentration of 5.2 milligrams per kilogram (mg/kg). The pH values of the samples ranged from 9.2 to 9.7. Lead, nickel, and chromium were detected in the two samples analyzed for various elements, anions, and organic compounds. Methylchloroform was detected in one sample.

In a followup sampling event conducted on July 13, 1983, nine samples were collected and analyzed for pH and cyanide. As with the initial round of samples, the exact sample locations are unknown. Cyanide was detected in five of the nine surface soil samples with a maximum concentration of 118 mg/kg. The soil pH ranged from 6.3 to 9.8.

8.3.2 PRC Team Plating Shop Investigation, 1992

The PRC team conducted additional soil sampling beneath the plating shop in 1992 (PRC/JMM, 1992a). Twenty surface soil samples were collected by hand auger through holes cut in the plating shop floor and were analyzed for SVOCs, metals, and total cyanide. To allow groundwater sample collection, nine of the hand-auger holes were extended to approximately 1 foot below the water table with hand augers. Temporary monitoring wells were constructed in these nine holes by placing 2-inch-diameter slotted polyvinyl chloride (PVC) casings into the holes. Groundwater samples were analyzed for VOCs, SVOCs, TRPH, metals, and total cyanide. Sampling locations were selected to be as close as possible to the wet trenches and were approved by the DTSC prior to the sampling. Two samples of surface dust and residue were collected from horizontal surfaces inside the plating shop and analyzed for metals content.

Four of the surface soil samples contained only one SVOC; one of the surface soil samples, B04-09, located at the northwest corner of the plating shop, contained three SVOCs. The maximum SVOC concentration in the surface soil samples was 1,900 µg/kg of fluoranthene at point B04-09.

Six metals compounds were tentatively identified as metals of concern in the plating shop investigation: beryllium, total chromium, copper, lead, mercury, and nickel. A summary of concentrations of these metals is presented below.

- Beryllium was detected in ten surface soil samples at concentrations ranging from 0.165 mg/kg to 0.424 mg/kg. The highest concentration was identified in boring B04-04, located in the northeastern corner of the plating shop.
- Total chromium was detected in all 20 samples at concentrations ranging from 24.0 mg/kg to 1,060 mg/kg. The highest concentrations were identified in borings B04-10, B04-11, and B04-01, located along the northeastern side of the plating shop.
- Copper was detected in all 20 surface samples at concentrations ranging from 9.38 mg/kg to 99.6 mg/kg. The highest concentration was identified in boring B04-10, located along the northeastern side of the plating shop.
- Lead was detected in all 20 surface samples at concentrations ranging from 2.15 mg/kg to 68.5 mg/kg. The highest concentration was detected in boring B04-01, located along the northeastern side of the plating shop.
- Mercury was identified in only the surface sample from B04-16, at a concentration of 0.111 mg/kg. Boring B04-16 is located near the central portion of the plating shop, between a wet trench for the cyanide process line and a wet trench for one of the chromium process lines.
- Nickel was identified in all 20 surface samples at concentrations ranging from 25.6 to 692 mg/kg. The highest concentration was identified in boring B04-05, located in the south-central portion of the plating shop. Relatively elevated concentrations were also detected in borings B04-01, B04-02, and B04-10, located in the southeastern and eastern portion of the plating shop.

Cyanide was detected in eight of the 20 surface samples. Concentrations ranged between 1 and 3 mg/kg in six of the samples. The maximum concentrations were 16 and 19 mg/kg in borings B04-09 and B04-16, respectively.

One sample of surface dust and one sample of material scraped from the floor of Building 360 were collected inside the plating shop. The scrape sample (W04-01) was collected from a stained area of the floor near boring B04-01. The dust sample (W04-02) was a composite collected from along the length of the walkway where borings B04-15 to B04-19 are located. Beryllium was not detected in the interior samples. Total chromium was detected at a concentration of 83,900 mg/kg in the scrape sample and at a concentration of 2,110 mg/kg in the dust sample. Due to the high concentrations of total chromium present in the scrape and dust samples, the Navy has closed the plating shop to personnel working in Building 360 pending further characterization of the plating shop interior.

The results of the groundwater sampling indicates that the common industrial solvents 1,1,1-trichloroethane (1,1,1-TCA), 1,1-dichloroethane (1,1-DCA), 1,1-dichloroethene (1,1-DCE), 1,2-dichloroethene (1,2-DCE), and trichloroethene (TCE) were found in groundwater samples. 1,1,1-TCA was detected in five samples at concentrations ranging from 1,200 micrograms per liter ($\mu\text{g/L}$) to 4.9 $\mu\text{g/L}$. 1,1-DCA was identified in eight samples at concentrations ranging from 65 to 1.1 $\mu\text{g/L}$. 1,1-DCE was detected in seven samples at concentrations ranging from 2.3 to 180 $\mu\text{g/L}$. 1,2-DCE was detected in four samples at concentrations ranging from 1.4 to 7.7 $\mu\text{g/L}$. The highest concentrations of these constituents were identified in samples G04-03 and G04-01, located in the northeast portion of the plating shop. TCE was detected in five samples at concentrations ranging from 1.3 to 13 $\mu\text{g/L}$. The highest concentration was identified in sample G04-05, also located in the northeast portion of the plating shop.

In general, the highest levels of metals in groundwater were detected in sample G04-09 at the northwest corner of the plating shop. Background data is presented in Table 3-3.

The groundwater electrical conductivity ranged from 150 to 800 micromhos per centimeter ($\mu\text{mhos/cm}$). TDS concentrations ranged from 141 to 884 mg/L. Thus, groundwater at the site is classified as fresh based on the concentrations of both TDS and conductivity (Table 2-1).

8.3.3 PRC Team Follow-On Plating Shop Investigation, 1992

In June and July of 1992, the PRC team performed follow-on field work in the Site 4 plating shop. The additional work performed in the plating shop consisted of the collection of 12 wipe and/or scrape samples from surfaces within the plating shop. A total of four scrape samples were collected from the floor, four wipe samples were collected from walls, and four wipe samples were collected from rafters and other fixtures within the plating shop. Samples were collected on June 9, 1992. Due to insufficient sample volume, additional sample was collected at two locations (W04-11 and W04-12) on July 2, 1992. All 12 samples were analyzed for metals plus hexavalent chromium and total cyanide. Details of this investigation were presented in the background data summary report (PRC/JMM, 1992c).

The additional sampling in the plating shop confirmed the previous Phases 2B and 3 findings of elevated levels of metals on surfaces within the inactive shop. In addition, this work indicates cyanide is present on interior surfaces of the plating shop. Sample results will be used to determine appropriate levels of health and safety protection that will be utilized by personnel conducting future work in the shop. These results can also be used by subcontractors working with the Navy in the decommissioning of the shop. Access restrictions previously imposed by the Navy will be maintained.

8.4 REMEDIAL INVESTIGATION

Canonie drilled nine soil borings and converted four boreholes to monitoring wells around the exterior of Building 360. The locations of the borings and monitoring wells are shown on Figure 8-1. The purpose of this investigation was to determine if surface spills or subsurface sewer leaks in areas other than the plating shop have impacted the site. Monitoring wells were constructed with 2-inch, Schedule 40 PVC with the screened interval extending from 5 to 15 feet bgs. Boring logs and well construction details are presented in Appendix C.

8.4.1 Site Geology/Hydrogeology

Boring logs from drilling indicate that the site is underlain by artificial fill ranging in thickness from 7.0 to 11.5 feet bgs. The artificial fill consists of light to dark brown, silty fine sand with traces of gravel and brick fragments. Native sediments consisting of the Merritt Sand underlie the artificial fill in all of the drilling locations except one, B360-5. In that location a 1-foot-thick lens of Bay Mud separates the artificial fill from the Merritt Sand. The Merritt Sand deposits consist of orange-brown, silty fine sand and clayey fine sand. The lens of Bay Mud consists of dark gray, silty clay with some fine sand. Figure 8-2 shows a generalized cross-section of the Site 4 subsurface. Geotechnical data are presented in Table 8-1 and Appendix D. Constant head laboratory tests indicate that the saturated soils at Site 4 have permeabilities (hydraulic conductivity) ranging between 5.0×10^{-8} and 9.0×10^{-7} cm/sec.

Groundwater was encountered between 4.5 and 6 feet bgs during drilling. Water level measurements taken on November 8, 1990 ranged between 4.94 and 5.54 feet bgs. The local groundwater gradient is 0.002 foot/foot. Based on groundwater surface elevations at Site 4 and the surrounding area, a groundwater high appears to be centered beneath the site (Figure 2-3) with groundwater flowing toward the bay. Gradients range from 0.002 foot/foot in the southerly direction to 0.004 foot/foot in the northerly direction. Groundwater samples collected from the four monitoring wells (MW360-1 through MW360-4) contained TDS ranging from 980 to 3,180 mg/L.

8.4.2 Analytical Results - Soil Samples

One-hundred-ten soil samples were taken for analysis during investigation at this site. Selected samples were chosen to be analyzed for VOCs, SVOCs, metals, cyanide, TOC, pH, and cation exchange capacity. Table 8-2 summarizes the analyses performed on the Site 4 samples.

8.4.2.1 Volatile Organic Compounds. Forty-five soil samples contained low detectable concentrations of 15 different VOCs. Table 8-3 summarizes the detected VOCs, and Figure 8-3 shows the locations of the soil samples. The VOCs detected are vinyl chloride, methylene chloride, acetone, 1,1-DCE, 1,1-DCA, 1,2-DCE, 2-butanone, 1,1,1-TCA, TCE, toluene, chlorobenzene, styrene, 1,3-dichlorobenzene, 1,4-dichlorobenzene, and 1,2-dichlorobenzene. Only one soil sample (8.5 feet bgs from MW360-4) contained total VOC concentrations above 1 mg/kg. The soil sample was collected from the saturated zone.

8.4.2.2 Semivolatile Organic Compounds. Thirteen SVOCs were detected; these compounds are summarized in Table 8-4 and shown on Figure 8-3. The 13 SVOCs are 1,2-dichlorobenzene, phenanthrene, anthracene, fluoranthene, pyrene, benzo(a)anthracene, chrysene, bis(2-ethylhexyl)phthalate, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, indeno(1,2,3-cd)pyrene, and benzo(g,h,i)perylene. None of the soil samples contained total SVOC concentrations above 10 mg/kg.

8.4.2.3 Metals. Fifty-seven soil samples collected as part of the investigation at this site were analyzed for 21 metals and are summarized in Table 8-5. Analytical results were compared to the 95 percent/95 percent statistical tolerance interval presented in the SWAT report (Table 3-1) and to the expected values of metals in native soils (Dragun, 1988). The estimated background ranges of metals in soil are given in Table 3-1, and typical concentration ranges of metals occurring naturally in soil are given in Table 3-2. Nine metals were detected at concentrations above the 95 percent/95 percent upper limit; arsenic, barium, calcium, chromium, cobalt, copper, nickel, sodium, and thallium. All sample results fell within the expected range for native soils except for one sample, in which lead was detected at 1,460 mg/kg, above the typical range but below the extreme range maximum of 3,000 mg/kg.

8.4.2.4 General Chemical Characteristics. Ten soil samples were analyzed for TOC. Cyanide was analyzed for in 27 soil samples and detected in 7 samples. The results of these analyses are summarized in Table 8-6 and shown on Figure 8-4. Four samples were analyzed for cation exchange capacity. Ten samples were analyzed for pH. These results are presented in Table 8-6.

8.4.3 Analytical Results - Groundwater Samples

Groundwater samples were collected from the four monitoring wells at this site, MW360-1, MW360-2, MW360-3, and MW360-4. The samples were analyzed for VOCs, SVOCs, metals, TOC, pH, TRPH, cyanide, specific conductivity, and general chemical characteristics.

8.4.3.1 Volatile Organic Compounds. Seven VOCs were detected in the four monitoring wells: vinyl chloride, 1,1-DCE, 1,2-DCE, 1,1-DCA, 1,1,1-TCA, TCE, and methylene chloride. Methylene chloride was detected in all four wells, but was also detected in three trip blanks. VOCs are summarized in Table 8-7 and shown on Figure 8-5.

8.4.3.2 Semivolatile Organic Compounds. Two SVOCs were detected in two monitoring wells, 1,4-dichlorobenzene and 1,2-dichlorobenzene. SVOCs are summarized in Table 8-7 and shown on Figure 8-5.

8.4.3.3 Metals. The samples collected from the four monitoring wells were analyzed for 20 native elements and the analytical results compared to the 95 percent/95 percent statistical tolerance interval presented in the SWAT report and to the expected values of metals in groundwater (Dragun, 1988). The estimated background ranges of metals in soil are given in Table 3-1, and typical concentration ranges of metals occurring naturally in soil are given in Table 3-2. According to the Canonie QAPP and QA/QC plan, groundwater samples for metals were field-filtered as appropriate with a 0.45-micron filter (Canonie, 1990b). Fourteen metals were detected above the 95 percent/95 percent statistical tolerance interval of background concentrations. Twelve metals were detected at concentrations above the typical range; four of these elements were in the extreme range, arsenic, iron, potassium, and sodium. One metal, vanadium, was detected in three wells at concentrations above the extreme maximum value. Table 8-8 summarizes the analytical results and Figure 8-6 shows the concentrations detected.

8.4.3.4 General Chemical Characteristics. Groundwater samples from all four monitoring wells at this site were analyzed for TOC, TRPH, dissolved oxygen, pH, specific conductivity, alkalinity, chloride, sulfate, TDS, cyanide, and total hardness. Detectable concentrations of TOC and TRPH were reported for each groundwater sample. Cyanide was not detected in any groundwater sample at this site. The results are summarized in Table 8-9 and shown on Figures 8-7 and 8-8.

8.5 SUMMARY AND CONCLUSIONS

The purpose of the Data Summary Report is to provide a qualitative assessment of the Canonie data to identify whether sufficient information has been collected for the RI/FS evaluation. As discussed in Section 3, QA/QC information is not available for the data validation; therefore, the data presented in this report have not been validated under EPA CLP procedures.

8.5.1 Soils

A total of 110 soil samples were collected by Canonie during the drilling of the four monitoring wells, converted from soil borings, and five soil borings surrounding Building 360 at Site 4. Samples were collected from the artificial fill, the Holocene Bay Mud Unit, and the Merritt Sand that have been identified at this site. VOCs, SVOCs, metals, and cyanide were detected in the Site 4 soil samples.

VOCs were detected in soil samples collected from both the fill and the Merritt Sand in all nine borings. Out of the 45 samples analyzed for VOCs, methylene chloride and acetone were detected in 41 and 32 samples, respectively. Thirteen other VOCs were detected, with no apparent pattern of occurrence. High VOC concentrations relative to the other detections were primarily from samples collected at depths below the water table. Low concentrations of VOCs were detected in soil samples taken above the water table. Only one soil sample, which was collected at 8.5 feet bgs from MW360-1, contained total VOC concentrations over 1 mg/kg.

Thirteen SVOCs were detected in seven borings. In three borings, only one SVOC, bis(2-ethylhexyl)-phthalate, was detected. In the other four borings (MW360-1 on the north side of the building, and MW360-4, B360-8, and B360-9 on the east side of the building), this phthalate was the only SVOC detected below 6 feet, with one exception, 1,2-dichlorobenzene, which was detected at 15.0 to 15.5 feet in MW360-1. No soil sample contained total SVOC concentrations above 10 mg/kg.

Nine metals were present in the soil samples at concentrations exceeding the 95 percent/95 percent statistical tolerance interval of background concentrations at NAS Alameda (PRC/JMM, 1992c). However, with the exception of lead in one sample, all metals analyzed were within the range of concentrations typically found in soils. The significance of the presence of metals above background levels will be further evaluated during the risk assessment to be performed during the comprehensive RI/FS process.

Cyanide was detected in seven samples from three soil borings at approximately 1 mg/kg or less. No TRPH analyses were performed on soil samples from this site.

If the analytical results can be validated and are considered to be acceptable, the following conclusions can be made:

- Results of VOC and SVOC analyses performed on soil samples did not indicate a major source of VOCs and SVOCs in soil outside of Building 360. However, results of VOC analyses performed on groundwater samples indicated that a VOC source may be present in the area. Therefore, additional investigation is necessary inside the building to assess whether Building 360 is a source for the VOCs in the groundwater.

- Because TRPH was detected in groundwater and no petroleum hydrocarbon analyses were performed on the soil samples, additional soil investigation is required to evaluate whether the soil has been impacted by petroleum hydrocarbons.
- Sufficient soil metals data have been collected for the RI/FS evaluation.

The significance of the presence of these VOCs, SVOCs, and metals will be further evaluated during the risk assessment to be performed during the comprehensive RI/FS work.

8.5.2 Groundwater

Four monitoring wells were installed by Canonie, one on each side of Building 360. Based on water level measurements taken in November 1990, groundwater flow for this site is toward the bay. Groundwater samples were taken from each well and analyzed for VOCs, SVOCs, metals, TRPH, cyanide, TOC, and general chemical characteristics.

Seven VOCs were detected in the groundwater samples. Methylene chloride was detected in all four groundwater samples and in three travel blanks. TCE was detected in wells MW360-1, MW360-2, and MW360-4 on the north, west, and east sides of Building 360, respectively; vinyl chloride and 1,2-DCE were also detected in MW360-4, on the east side of the building, and in MW360-2, downgradient from MW360-4. 1,1-DCE, 1,1-DCA, and 1,1,1-TCA were only detected in monitoring well MW360-2.

Four SVOCs, 1,4-dichlorobenzene, 1,2-dichlorobenzene, n-nitroso-di-phenylamine, and bis(2-ethylhexyl)phthalate, were detected in the two monitoring wells, MW360-2 and MW360-4, which also had the greatest number of VOCs. One SVOC, bis(2-ethylhexyl)phthalate, detected in MW360-4, was also detected with regularity in the soil samples. This compound may be a laboratory artifact.

All four wells had detectable (approximately 1.28 mg/L or less) concentrations of TRPH, and TOC was also detected in all four wells. Cyanide was not detected in any of the groundwater samples at this site.

Fourteen metals were present in the groundwater at concentrations exceeding the 95 percent/95 percent statistical tolerance interval of background concentrations at NAS Alameda (PRC/JMM, 1992c). Based on Table 3-4, which presents both a typical range and an extreme value for natural concentrations of various elements in groundwater, 12 of these metals detected in the groundwater have an extreme upper value for natural concentrations found in groundwater. The concentrations of metals detected in the groundwater at Site 4 are less than natural extreme upper values with the exception of vanadium, which was detected at a concentration above the extreme upper value typical for vanadium in groundwater (Table 3-4). The significance

of the presence of metals above background levels will be further evaluated during the risk assessment to be performed during the comprehensive RI/FS process.

If the analytical results can be validated and are considered to be acceptable, the following conclusions can be made:

- Elevated concentrations of TCE have been found in groundwater samples collected from monitoring wells MW360-1, MW360-2, and MW360-4. Additional groundwater wells are required to further evaluate the extent of TCE in groundwater, particularly towards the east, which is a residential neighborhood.
- Metals are present in the groundwater at concentrations that exceed the 95 percent/95 percent statistical tolerance level. Additional data will be required to characterize the groundwater quality at this site.
- Additional TDS data are required to evaluate whether groundwater beneath the site is considered as potential drinking water.
- At present, no information is available to evaluate the tidal influence on groundwater and the deeper groundwater-bearing zone. Additional work is required to evaluate the tidal influence and the deeper groundwater-bearing zone.

The significance of the presence of these VOCs, SVOCs, TRPH, and metals will be further evaluated during the risk assessment to be performed during the comprehensive RI/FS work.

TABLE 8-1

**SITE 4 - BUILDING 360, AIRCRAFT ENGINE FACILITY
GEOTECHNICAL SAMPLE LABORATORY TEST RESULTS**

Sample No.	Depth (ft)	Soil Classification		Moisture Content (%)	Dry Density (pcf)	Specific Gravity	Hydraulic Conductivity (cm/s)
		Laboratory	Field				
MW360-1	4	SP	SP	16.5	102.1	2.68	2.00E-03
MW360-1	10	SM	SP	16.1	116.2	NA	NA
MW360-1	10.5	SC	SC	21.5	105.6	NA	5.00E-08
MW360-2	5.5	SM	SM	16.6	116.7	NA	NA
MW360-2	11	SM	SC				
MW360-2	13.5	NA	SC	23.3	104.7	NA	9.00E-07
MW360-3	3.5	SC	SM	31.4	84.4	NA	NA
MW360-3	7	SM	SM	14.1	117.4	NA	NA
MW360-3	7.5	SM	SM				
MW360-3	13.5	SP	SM	17.2	113.8	NA	NA
MW360-4	4	SP/SM	SM	17.2	113.8	NA	NA
B360-5	4	SP/SM	SM	NA	NA	NA	NA
B360-5	13.5	SM	SM	NA	NA	NA	NA
B360-6	4	SM	SM	NA	NA	NA	NA
B360-6	6.5	SM	GP/SM	NA	NA	NA	NA
B360-7	3.5	SM	SM	NA	NA	NA	NA
B360-7	10	SM	SM	NA	NA	NA	NA
B360-8	4	SM	SM	NA	NA	NA	NA
B360-8	7	SC	CL	NA	NA	NA	NA
B360-9	4	SM	SM	NA	NA	NA	NA
B360-9	13	SM	SC	NA	NA	NA	NA

Notes:

NA - Not Analyzed

Parameters not detected are reported as less than method detection limit.

Laboratory Methods (Units):

Soil Classification - Unified Soil Classification System (USCS) - ASTM D2488

Moisture Content - ASTM D2216 (percent)

Dry Density - ASTM D2937 (pounds per cubic foot)

Specific Gravity - ASTM D854

Hydraulic Conductivity - EPA 9100 (centimeters per second)

Soil Classification Legend:

GW	Well graded gravels, gravel-sand mixtures, little or no fines	SM	Silty sands, sand-silt mixtures
		SC	Clayey sands, sand-clay mixtures
GP	Poorly graded gravels, gravel-sand mixtures, little or no fines	ML	Inorganic silts and very fine sands, rock flow silty or clayey fine sands or clayey silts with slight plasticity
GM	Silty gravels, gravel-sand-silt mixtures		
GC	Clayey gravels, gravel-sand-clay mixtures	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
SW	Well graded sands, gravelly sands, little or no fines	OL	Organic silts and organic silty clays or low plasticity
SP	Poorly-graded sands, gravelly sands, little or no fines	CH	Inorganic clays of high plasticity, fat clays

SITE 4 - BUILDING 360, AIRCRAFT ENGINE FACILITY
SUMMARY OF LABORATORY ANALYSES PERFORMED ON SOIL AND GROUNDWATER SAMPLES
(Sheet 1 of 5)

Boring	Depth	Matrix	Alkalinity/Acidity	Ammonia	Ammonium	Asbestos (Tot)	Ash (Tot)	SVOC	BTU Value	Cations/Anions	CEC	Cyanide (Tot)	DO (Tot)	EDB	Herb Uniq	Herbicides	Mercury	Metals	Pes/PCB	pH	Phosphorous	Potassium	Radiation	Spec. Con.	Kjeldahl Nitrogen	TOC	TPH as Diesel	TRPH	TS/TDS	VOC
B360-5	1.0-1.5	Soil					.									.														
B360-5	1.5-2.0	Soil							.								.								.					
B360-5	2.5-3.0	Soil																												.
B360-5	3.0-3.5	Soil					.										.		.											
B360-5	5.5-6.0	Soil															.													.
B360-5	6.0-6.5	Soil					.										.													.
B360-5	9.5-10.0	Soil																												.
B360-5	10.0-10.5	Soil					.										.													.
B360-5	11.0-11.5	Soil																												.
B360-5	11.5-12.0	Soil					.										.													.
B360-5	14.5-15.0	Soil																												.
B360-5	15.0-15.5	Soil					.										.													.
B360-6	0.5-1.0	Soil					.			.							.													.
B360-6	2.0-2.5	Soil																												.
B360-6	2.5-3.0	Soil					.			.							.		.											.
B360-6	3.5-4.0	Soil						.																	.					.
B360-6	5.0-5.5	Soil																												.
B360-6	5.5-6.0	Soil					.			.							.													.
B360-6	8.5-9.0	Soil																												.
B360-6	9.0-9.5	Soil					.			.							.													.
B360-6	11.5-12.0	Soil																												.
B360-6	12.0-12.5	Soil					.			.							.													.
B360-6	13.0-13.5	Soil																												.
B360-6	13.5-14.0	Soil					.			.							.													.
B360-6R	1.0-1.5	Soil					.			.							.		.											.
B360-6R	1.5-2.0	Soil							.																.					.
B360-7	1.0-1.5	Soil					.			.							.													.

SITE 4 - BUILDING 360, AIRCRAFT ENGINE FACILITY
SUMMARY OF LABORATORY ANALYSES PERFORMED ON SOIL AND GROUNDWATER SAMPLES
 (Sheet 2 of 5)

Boring	Depth	Matrix	Alkalinity/Acidity	Ammonia	Ammonium	Asbestos (Tot)	Ash (Tot)	SVOC	BTU Value	Cations/Anions	CEC	Cyanide (Tot)	DO (Tot)	EDB	Herb Uniq	Herbicides	Mercury	Metals	Pes/PCB	pH	Phosphorous	Potassium	Radiation	Spec. Con.	Kjeldahl Nitrogen	TOC	TPH as Diesel	TRPH	TSS/TDS	VOC
B360-7	1.5-2.0	Soil																							*					
B360-7	2.5-3.0	Soil																												*
B360-7	3.0-3.5	Soil				*				*							*		*											*
B360-7	5.0-5.5	Soil																												*
B360-7	5.5-6.0	Soil				*				*							*													*
B360-7	8.5-9.0	Soil																												*
B360-7	9.0-9.5	Soil				*				*							*													*
B360-7	9.5-10.0	Soil				*				*							*													*
B360-7	11.0-11.5	Soil																												*
B360-7	11.5-12.0	Soil				*				*							*													*
B360-7	14.5-15.0	Soil				*				*							*													*
B360-7	15.0-15.5	Soil				*				*							*													*
B360-8	1.0-1.5	Soil				*											*													*
B360-8	1.5-2.0	Soil																							*					*
B360-8	2.5-3.0	Soil																												*
B360-8	3.0-3.5	Soil				*											*		*											*
B360-8	5.0-5.5	Soil															*													*
B360-8	5.5-6.0	Soil				*											*													*
B360-8	8.5-9.0	Soil				*											*													*
B360-8	9.0-9.5	Soil				*											*													*
B360-8	11.5-12.0	Soil				*											*													*
B360-8	12.0-12.5	Soil				*											*													*
B360-8	14.5-15.0	Soil				*											*													*
B360-8	15.0-15.5	Soil				*											*													*
B360-9	0.5-1.0	Soil				*											*								*					*
B360-9	1.5-2.0	Soil																							*					*
B360-9	2.0-2.5	Soil																							*					*

SITE 4 - BUILDING 360, AIRCRAFT ENGINE FACILITY
SUMMARY OF LABORATORY ANALYSES PERFORMED ON SOIL AND GROUNDWATER SAMPLES
 (Sheet 3 of 5)

[illegible]

TABLE 8-2

SITE 4 - BUILDING 360, AIRCRAFT ENGINE FACILITY
SUMMARY OF LABORATORY ANALYSES PERFORMED ON SOIL AND GROUNDWATER SAMPLES
 (Sheet 5 of 5)

Boring	Depth	Matrix	Alkalinity/Acidity	Ammonia	Ammonium	Asbestos (Tot)	Ash (Tot)	SVOC	BTU Value	Cations/Anions	CEC	Cyanide (Tot)	DO (Tot)	EDB	Herb Uniq	Herbicides	Mercury	Metals	Pest/PCB	pH	Phosphorous	Potassium	Radiation	Spec. Con.	Kjeldahl Nitrogen	TOC	TPH as Diesel	TRPH	TS/TDS	VOC
MW360-4	14.0-14.5	Soil				.																								.
MW360-4	14.5-15.0	Soil									.						.													.
Summary Soil						57			4	27							57		10						10					45
200-4	0.0	Water																												.
201-4	0.0	Water																												.
MW360-1	0.0	Water	.			.					.	.					.		.			.		.	.	.	.	.	.	.
MW360-2	0.0	Water	.			.					.	.					.		.			.		.	.	.	.	.	.	.
MW360-3	0.0	Water	.			.					.	.					.		.			.		.	.	.	.	.	.	.
MW360-4	0.0	Water	.			.					.	.					.		.			.		.	.	.	.	.	.	.
Summary Water			4			4			4	4							4		4			4		4		4	4	4	6	

Notes:

200-series boring numbers indicate travel blanks

Analysis	Methods	Matrix	Analysis	Methods	Matrix
DO	DO	water	Tot Cyanide	EPA 335.2	soil
Spec Con	EPA 120.1	water	Tot Cyanide	EPA 9010	soil
Misc			TOC	EPA 415.2	water
TDS	EPA 160.1	water	TOC	EPA/CE81-1	soil
Sulfate	EPA 300.0	water	TRPH	EPA 418.1	water
Chloride	EPA 300.0(mod)	water	VOC	EPA 624	water
Acidity	EPA 305.1	water	VOC	EPA 8240	soil
Alkalinity	EPA 310.1	water	SVOC	EPA 8270	soil
Alkalinity	SM 403	water	pH	EPA 9045	water
Foaming Agents	EPA 425.1	water	CEC	USBR 514.8	soil
Hardness	SM 314A	water			
Metals	EPA 200.7	water			
Metals	EPA 6010	soil			

TABLE 8-3

SITE 4 - BUILDING 360, AIRCRAFT ENGINE FACILITY
RESULTS FOR VOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 1 of 7)

Parameter Reported	B360-5 06/25/90 2.5-3 ft	B360-5 06/26/90 5.5-6 ft	B360-5 06/25/90 9.5-10 ft	B360-5 06/26/90 11-11.5 ft	B360-5 06/25/90 14.5-15 ft	B360-6 06/25/90 2-2.5 ft	B360-6 06/25/90 5-5.5 ft
Vinyl Chloride (ug/kg)	<11.0	<12.0	<13.0	<12.0	<12.0	<11.0	<12.0
Methylene Chloride (ug/kg)	7	7	7	7	7	32	35
Acetone (ug/kg)	5	5	10	8	12	<11.0	<12.0
1,1-Dichloroethene (ug/kg)	<5.00	<6.00	<6.00	<6.00	<6.00	<5.60	<5.80
1,1-Dichloroethane (ug/kg)	<5.00	<6.00	4	<6.00	<6.00	<5.60	<5.80
1,2-Dichloroethene (total) (ug/kg)	<5.00	<6.00	<6.00	<6.00	<6.00	<5.60	<5.80
2-Butanone (ug/kg)	<11.0	<12.0	<13.0	<12.0	<12.0	19	<12.0
1,1,1-Trichloroethane (ug/kg)	2	<6.00	2	<6.00	<6.00	8	<5.80
Trichloroethene (ug/kg)	<5.00	<6.00	<6.00	<6.00	<6.00	<5.60	<5.80
Toluene (ug/kg)	160	4	7	3	6	<5.60	<5.80
Chlorobenzene (ug/kg)	<5.00	<6.00	<6.00	<6.00	<6.00	<5.60	<5.80
Styrene (ug/kg)	<5.00	<6.00	1	<6.00	<6.00	<5.60	<5.80
1,3-Dichlorobenzene (ug/kg)	<5.00	<6.00	<6.00	<6.00	<6.00	NA	NA
1,4-Dichlorobenzene (ug/kg)	<5.00	<6.00	<6.00	<6.00	<6.00	NA	NA
1,2-Dichlorobenzene (ug/kg)	<5.00	<6.00	<6.00	<6.00	<6.00	NA	NA

Notes: NA = Not Analyzed

< = Detection Limit

ug/kg = micrograms per kilogram

Data not validated by JMM

TABLE 8-3

SITE 4 - BUILDING 360, AIRCRAFT ENGINE FACILITY
RESULTS FOR VOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
 (Sheet 2 of 7)

Parameter Reported	B360-6 06/25/90 8.5-9 ft	B360-6 06/25/90 11.5-12 ft	B360-6 06/25/90 13-13.5 ft	B360-7 06/26/90 2.5-3 ft	B360-7 06/26/90 5-5.5 ft	B360-7 06/26/90 8.5-9 ft	B360-7 06/26/90 11-11.5 ft
Vinyl Chloride (ug/kg)	<12.0	<12.0	<12.0	<11.0	<12.0	<12.0	<12.0
Methylene Chloride (ug/kg)	71	35	32	38	28	27	36
Acetone (ug/kg)	<12.0	<12.0	<12.0	<11.0	23	<12.0	<12.0
1,1-Dichloroethene (ug/kg)	<6.10	<6.00	<6.00	<5.40	<6.20	<5.90	<6.20
1,1-Dichloroethane (ug/kg)	<6.10	<6.00	<6.00	<5.40	<6.20	<5.90	<6.20
1,2-Dichloroethene (total) (ug/kg)	<6.10	<6.00	<6.00	<5.40	<6.20	<5.90	<6.20
2-Butanone (ug/kg)	<12.0	<12.0	<12.0	<11.0	<12.0	<12.0	<12.0
1,1,1-Trichloroethane (ug/kg)	<6.10	<6.00	6	<5.40	<6.20	<5.90	<6.20
Trichloroethene (ug/kg)	<6.10	<6.00	<6.00	<5.40	<6.20	<5.90	<6.20
Toluene (ug/kg)	<6.10	<6.00	<6.00	77	<6.20	<5.90	<6.20
Chlorobenzene (ug/kg)	<6.10	<6.00	<6.00	<5.40	<6.20	<5.90	<6.20
Styrene (ug/kg)	<6.10	<6.00	<6.00	<5.40	<6.20	<5.90	<6.20
1,3-Dichlorobenzene (ug/kg)	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene (ug/kg)	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene (ug/kg)	NA	NA	NA	NA	NA	NA	NA

Notes: NA = Not Analyzed
 < = Detection Limit
 ug/kg = micrograms per kilogram
 Data not validated by JMM

TABLE 8-3

SITE 4 - BUILDING 360, AIRCRAFT ENGINE FACILITY
RESULTS FOR VOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
 (Sheet 3 of 7)

Parameter Reported	B360-7 06/26/90 14.5-15 ft	B360-8 07/08/90 2.5-3 ft	B360-8 06/26/90 5-5.5 ft	B360-8 06/26/90 8.5-9 ft	B360-8 07/08/90 11.5-12 ft	B360-8 06/26/90 14.5-15 ft	B360-9 06/26/90 2-2.5 ft
Vinyl Chloride (ug/kg)	<12.0	<12.0	<12.0	<12.0	<12.0	<12.0	<18.0
Methylene Chloride (ug/kg)	28	5	6	4	6	6	<9.00
Acetone (ug/kg)	<12.0	92	15	10	8	8	<18.0
1,1-Dichloroethene (ug/kg)	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00	<9.00
1,1-Dichloroethane (ug/kg)	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00	<9.00
1,2-Dichloroethene (total) (ug/kg)	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00	<9.00
2-Butanone (ug/kg)	<12.0	28	<12.0	<12.0	<12.0	<12.0	<18.0
1,1,1-Trichloroethane (ug/kg)	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00	<9.00
Trichloroethene (ug/kg)	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00	<9.00
Toluene (ug/kg)	21	95	6	31	14	5	190
Chlorobenzene (ug/kg)	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00	<9.00
Styrene (ug/kg)	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00	<9.00
1,3-Dichlorobenzene (ug/kg)	NA	<6.00	<6.00	<6.00	<6.00	<6.00	<9.00
1,4-Dichlorobenzene (ug/kg)	NA	<6.00	<6.00	<6.00	<6.00	<6.00	<9.00
1,2-Dichlorobenzene (ug/kg)	NA	<6.00	<6.00	<6.00	<6.00	<6.00	<9.00

Notes: NA = Not Analyzed
 < = Detection Limit
 ug/kg = micrograms per kilogram
 Data not validated by JMM

TABLE 8-3

SITE 4 - BUILDING 360, AIRCRAFT ENGINE FACILITY
RESULTS FOR VOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 4 of 7)

Parameter Reported	B360-9 06/26/90 5-5.5 ft	B360-9 07/08/90 9-9.5 ft	B360-9 06/26/90 11.5-12 ft	B360-9 06/26/90 15-15.5 ft	MW360-1 06/28/90 2.5-3 ft	MW360-1 06/28/90 5-5.5 ft	MW360-1 06/27/90 8.5-9 ft
Vinyl Chloride (ug/kg)	<12.0	<12.0	<12.0	<13.0	<10.0	<12.0	<12.0
Methylene Chloride (ug/kg)	6	7	7	7	9	12	10
Acetone (ug/kg)	10	5	4	12	15	32	18
1,1-Dichloroethene (ug/kg)	<6.00	<6.00	<6.00	<6.00	<5.00	<6.00	<6.00
1,1-Dichloroethane (ug/kg)	<6.00	<6.00	<6.00	<6.00	<5.00	<6.00	<6.00
1,2-Dichloroethene (total) (ug/kg)	<6.00	<6.00	<6.00	<6.00	<5.00	<6.00	4
2-Butanone (ug/kg)	<12.0	<12.0	<12.0	<13.0	<10.0	<7.00	<12.0
1,1,1-Trichloroethane (ug/kg)	<6.00	<6.00	<6.00	<6.00	<5.00	<6.00	<6.00
Trichloroethene (ug/kg)	<6.00	<6.00	<6.00	<6.00	<5.00	<6.00	9
Toluene (ug/kg)	5	8	7	7	5	5	5
Chlorobenzene (ug/kg)	<6.00	<6.00	<6.00	<6.00	<5.00	<6.00	<6.00
Styrene (ug/kg)	<6.00	<6.00	<6.00	<6.00	<5.00	<6.00	<6.00
1,3-Dichlorobenzene (ug/kg)	<6.00	<6.00	<6.00	<6.00	<5.00	<6.00	<6.00
1,4-Dichlorobenzene (ug/kg)	<6.00	<6.00	<6.00	<6.00	<5.00	<6.00	<6.00
1,2-Dichlorobenzene (ug/kg)	<6.00	<6.00	<6.00	<6.00	<5.00	<6.00	<6.00

Notes: NA = Not Analyzed

< = Detection Limit

ug/kg = micrograms per kilogram

Data not validated by JMM

TABLE 8-3

SITE 4 - BUILDING 360, AIRCRAFT ENGINE FACILITY
RESULTS FOR VOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
 (Sheet 5 of 7)

Parameter Reported	MW360-1 06/28/90 11.5-12 ft	MW360-1 06/28/90 14.5-15 ft	MW360-2 06/27/90 2.5-3 ft	MW360-2 06/28/90 7-7.5 ft	MW360-2 06/27/90 8.5-9 ft	MW360-2 06/27/90 11.5-12 ft	MW360-2 06/28/90 14.5-15 ft
Vinyl Chloride (ug/kg)	<30.0	<30.0	<11.0	<12.0	<12.0	<12.0	<12.0
Methylene Chloride (ug/kg)	<15.0	<15.0	7	7	7	7	8
Acetone (ug/kg)	<30.0	<30.0	10	16	19	12	11
1,1-Dichloroethene (ug/kg)	<15.0	<15.0	<6.00	12	46	10	<6.00
1,1-Dichloroethane (ug/kg)	<15.0	<15.0	<6.00	14	31	4	<6.00
1,2-Dichloroethene (total) (ug/kg)	12	10	<6.00	<6.00	<6.00	2	<6.00
2-Butanone (ug/kg)	<30.0	<30.0	<11.0	<12.0	<12.0	<12.0	<12.0
1,1,1-Trichloroethane (ug/kg)	<15.0	<15.0	<6.00	43	170	15	<6.00
Trichloroethene (ug/kg)	340	510	<6.00	4	23	4	1
Toluene (ug/kg)	8	21	83	4	12	8	3
Chlorobenzene (ug/kg)	<15.0	<15.0	<6.00	<6.00	<6.00	<6.00	<6.00
Styrene (ug/kg)	<15.0	<15.0	<6.00	<6.00	<6.00	<6.00	<6.00
1,3-Dichlorobenzene (ug/kg)	<15.0	<15.0	<6.00	<6.00	<6.00	<6.00	<6.00
1,4-Dichlorobenzene (ug/kg)	9	11	<6.00	<6.00	<6.00	<6.00	<6.00
1,2-Dichlorobenzene (ug/kg)	45	37	<6.00	<6.00	<6.00	<6.00	<6.00

Notes: NA = Not Analyzed

< = Detection Limit

ug/kg = micrograms per kilogram

Data not validated by JMM

TABLE 8-3

SITE 4 - BUILDING 360, AIRCRAFT ENGINE FACILITY
RESULTS FOR VOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
 (Sheet 6 of 7)

Parameter Reported	MW360-3 06/27/90 2.5-3 ft	MW360-3 06/27/90 5-5.5 ft	MW360-3 06/27/90 8.5-9 ft	MW360-3 06/27/90 11.5-12 ft	MW360-3 06/27/90 14.5-15 ft	MW360-4 06/27/90 2.5-3 ft	MW360-4 06/27/90 5-5.5 ft
Vinyl Chloride (ug/kg)	<11.0	<11.0	<12.0	<12.0	<12.0	<11.0	<14.0
Methylene Chloride (ug/kg)	4	4	4	3	4	3	5
Acetone (ug/kg)	8	21	9	19	8	5	34
1,1-Dichloroethene (ug/kg)	<6.00	<6.00	<6.00	<6.00	<6.00	<5.00	<7.00
1,1-Dichloroethane (ug/kg)	<6.00	<6.00	<6.00	<6.00	<6.00	<5.00	<7.00
1,2-Dichloroethene (total) (ug/kg)	<6.00	<6.00	<6.00	<6.00	<6.00	<5.00	<7.00
2-Butanone (ug/kg)	<11.0	3	<12.0	<12.0	<12.0	<11.0	7
1,1,1-Trichloroethane (ug/kg)	<6.00	<6.00	<6.00	<6.00	<6.00	<5.00	<7.00
Trichloroethene (ug/kg)	<6.00	<6.00	<6.00	<6.00	<6.00	<5.00	<7.00
Toluene (ug/kg)	100	30	7	5	<6.00	11	78
Chlorobenzene (ug/kg)	<6.00	<6.00	<6.00	<6.00	<6.00	<5.00	2
Styrene (ug/kg)	<6.00	<6.00	<6.00	<6.00	<6.00	<5.00	<7.00
1,3-Dichlorobenzene (ug/kg)	<6.00	<6.00	<6.00	<6.00	<6.00	<5.00	<7.00
1,4-Dichlorobenzene (ug/kg)	<6.00	<6.00	<6.00	<6.00	<6.00	<5.00	<7.00
1,2-Dichlorobenzene (ug/kg)	<6.00	<6.00	<6.00	<6.00	<6.00	<5.00	2

Notes: NA = Not Analyzed

< = Detection Limit

ug/kg = micrograms per kilogram

Data not validated by JMM

TABLE 8-3

SITE 4 - BUILDING 360, AIRCRAFT ENGINE FACILITY
RESULTS FOR VOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
 (Sheet 7 of 7)

Parameter Reported	MW360-4 06/27/90 8.5-9 ft	MW360-4 06/27/90 11.5-12 ft	MW360-4 06/27/90 14-14.5 ft
Vinyl Chloride (ug/kg)	84	<12.0	<12.0
Methylene Chloride (ug/kg)	<30.0	4	4
Acetone (ug/kg)	<60	7	10
1,1-Dichloroethene (ug/kg)	<30.0	<6.00	<6.00
1,1-Dichloroethane (ug/kg)	13	<6.00	<6.00
1,2-Dichloroethene (total) (ug/kg)	480	16	<6.00
2-Butanone (ug/kg)	<60	<12.0	<12.0
1,1,1-Trichloroethane (ug/kg)	<30.0	<6.00	<6.00
Trichloroethene (ug/kg)	1200	43	11
Toluene (ug/kg)	<30.0	7	5
Chlorobenzene (ug/kg)	16	<6.00	<6.00
Styrene (ug/kg)	<30.0	<6.00	<6.00
1,3-Dichlorobenzene (ug/kg)	<30.0	<6.00	<6.00
1,4-Dichlorobenzene (ug/kg)	27	<6.00	<6.00
1,2-Dichlorobenzene (ug/kg)	90	<6.00	<6.00

Notes: NA = Not Analyzed
 < = Detection Limit
 ug/kg = micrograms per kilogram
 Data not validated by JMM

TABLE 8-4

SITE 4 - BUILDING 360, AIRCRAFT ENGINE FACILITY
RESULTS FOR SEMIVOLATILE COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 1 of 6)

Parameter Reported	B360-5 06/25/90 1-1.5 ft	B360-5 06/25/90 3-3.5 ft	B360-5 06/25/90 6-6.5 ft	B360-5 06/25/90 10-10.5 ft	B360-5 06/26/90 11.5-12 ft	B360-5 06/25/90 15-15.5 ft	B360-8 07/08/90 1-1.5 ft
1,2-Dichlorobenzene (ug/kg)	<350	<360	<390	<390	<380	<400	<370
Phenanthrene (ug/kg)	<350	<360	<390	<390	<380	<400	<370
Anthracene (ug/kg)	<350	<360	<390	<390	<380	<400	<370
Fluoranthene (ug/kg)	<350	<360	<390	<390	<380	<400	<370
Pyrene (ug/kg)	<350	<360	<390	<390	<380	<400	<370
Benzo(a)anthracene (ug/kg)	<350	<360	<390	<390	<380	<400	<370
Chrysene (ug/kg)	<350	<360	<390	<390	<380	<400	<370
bis(2-Ethylhexyl)phthalate (ug/kg)	210	87	67	230	83	190	130
Benzo(b)fluoranthene (ug/kg)	<350	<360	<390	<390	<380	<400	<370
Benzo(k)fluoranthene (ug/kg)	<350	<360	<390	<390	<380	<400	<370
Benzo(a)pyrene (ug/kg)	<350	<360	<390	<390	<380	<400	<370
Indeno(1,2,3-cd)pyrene (ug/kg)	<350	<360	<390	<390	<380	<400	<370
Benzo(g,h,i)perylene (ug/kg)	<350	<360	<390	<390	<380	<400	<370

Notes: NA = Not Analyzed
< = Detection Limit
ug/kg = micrograms per kilogram
Data not validated by JMM

TABLE 8-4

SITE 4 - BUILDING 360, AIRCRAFT ENGINE FACILITY
RESULTS FOR SEMIVOLATILE COMPOUNDS DETECTED IN SOIL SAMPLES
 (Sheet 2 of 6)

Parameter Reported	B360-8 07/08/90 3-3.5 ft	B360-8 07/08/90 5.5-6 ft	B360-8 07/08/90 9-9.5 ft	B360-8 06/26/90 12-12.5 ft	B360-8 07/08/90 15-15.5 ft	B360-9 07/08/90 0.5-1 ft	B360-9 07/08/90 2.5-3 ft
1,2-Dichlorobenzene (ug/kg)	<400	<420	<390	<410	<400	<1800	<360
Phenanthrene (ug/kg)	95	<420	<390	<410	<400	<1800	38
Anthracene (ug/kg)	<400	<420	<390	<410	<400	290	<360
Fluoranthene (ug/kg)	91	<420	<390	<410	<400	<1800	<360
Pyrene (ug/kg)	92	<420	<390	<410	<400	<1800	67
Benzo(a)anthracene (ug/kg)	<400	<420	<390	<410	<400	<1800	60
Chrysene (ug/kg)	<400	<420	<390	<410	<400	<1800	68
bis(2-Ethylhexyl)phthalate (ug/kg)	250	160	2400	210	120	<1800	150
Benzo(b)fluoranthene (ug/kg)	43	<420	<390	<410	<400	<1800	47
Benzo(k)fluoranthene (ug/kg)	83	<420	<390	<410	<400	<1800	75
Benzo(a)pyrene (ug/kg)	59	<420	<390	<410	<400	<1800	55
Indeno(1,2,3-cd)pyrene (ug/kg)	<400	<420	<390	<410	<400	<1800	<360
Benzo(g,h,i)perylene (ug/kg)	<400	<420	<390	<410	<400	<1800	<360

Notes: NA = Not Analyzed

< = Detection Limit

ug/kg = micrograms per kilogram

Data not validated by JMM

TABLE 8-4

SITE 4 - BUILDING 360, AIRCRAFT ENGINE FACILITY
RESULTS FOR SEMIVOLATILE COMPOUNDS DETECTED IN SOIL SAMPLES
 (Sheet 3 of 6)

Parameter Reported	B360-9 07/08/90 5.5-6 ft	B360-9 07/08/90 9.5-10 ft	B360-9 07/08/90 12-12.5 ft	B360-9 07/08/90 15.5-16 ft	MW360-1 06/28/90 0.5-1 ft	MW360-1 06/28/90 5.5-6 ft	MW360-1 06/28/90 12-12.5 ft
1,2-Dichlorobenzene (ug/kg)	<390	<380	<390	<380	<730	<410	<390
Phenanthrene (ug/kg)	<390	<380	<390	<380	110	170	<390
Anthracene (ug/kg)	<390	<380	<390	<380	<730	<410	<390
Fluoranthene (ug/kg)	<390	<380	<390	<380	<730	190	<390
Pyrene (ug/kg)	<390	<380	<390	<380	<730	230	<390
Benzo(a)anthracene (ug/kg)	<390	<380	<390	<380	<730	140	<390
Chrysene (ug/kg)	<390	<380	<390	<380	<730	150	<390
bis(2-Ethylhexyl)phthalate (ug/kg)	110	150	340	630	<730	<410	79
Benzo(b)fluoranthene (ug/kg)	<390	<380	<390	<380	<730	100	<390
Benzo(k)fluoranthene (ug/kg)	<390	<380	<390	<380	<730	110	<390
Benzo(a)pyrene (ug/kg)	<390	<380	<390	<380	<730	110	<390
Indeno(1,2,3-cd)pyrene (ug/kg)	<390	<380	<390	<380	<730	<410	<390
Benzo(g,h,i)perylene (ug/kg)	<390	<380	<390	<380	<730	<410	<390

Notes: NA = Not Analyzed
 < = Detection Limit
 ug/kg = micrograms per kilogram
 Data not validated by JMM

TABLE 8-4

SITE 4 - BUILDING 360, AIRCRAFT ENGINE FACILITY
RESULTS FOR SEMIVOLATILE COMPOUNDS DETECTED IN SOIL SAMPLES
 (Sheet 4 of 6)

Parameter Reported	MW360-1 06/28/90 15-15.5 ft	MW360-2 06/28/90 7.5-8 ft	MW360-2 06/27/90 12-12.5 ft	MW360-2 06/28/90 15-15.5 ft	MW360-3 06/27/90 2.5-3 ft	MW360-3 06/27/90 5-5.5 ft	MW360-3 06/27/90 8.5-9 ft
1,2-Dichlorobenzene (ug/kg)	56	<400	<390	<390	<360	<400	<400
Phenanthrene (ug/kg)	<390	<400	<390	<390	<360	<400	<400
Anthracene (ug/kg)	<390	<400	<390	<390	<360	<400	<400
Fluoranthene (ug/kg)	<390	<400	<390	<390	<360	<400	<400
Pyrene (ug/kg)	<390	<400	<390	<390	<360	<400	<400
Benzo(a)anthracene (ug/kg)	<390	<400	<390	<390	<360	<400	<400
Chrysene (ug/kg)	<390	<400	<390	<390	<360	<400	<400
bis(2-Ethylhexyl)phthalate (ug/kg)	<390	66	110	52	97	61	65
Benzo(b)fluoranthene (ug/kg)	<390	<400	<390	<390	<360	<400	<400
Benzo(k)fluoranthene (ug/kg)	<390	<400	<390	<390	<360	<400	<400
Benzo(a)pyrene (ug/kg)	<390	<400	<390	<390	<360	<400	<400
Indeno(1,2,3-cd)pyrene (ug/kg)	<390	<400	<390	<390	<360	<400	<400
Benzo(g,h,i)perylene (ug/kg)	<390	<400	<390	<390	<360	<400	<400

Notes: NA = Not Analyzed

< = Detection Limit

ug/kg = micrograms per kilogram

Data not validated by JMM

TABLE 8-4

SITE 4 - BUILDING 360, AIRCRAFT ENGINE FACILITY
RESULTS FOR SEMIVOLATILE COMPOUNDS DETECTED IN SOIL SAMPLES
 (Sheet 5 of 6)

Parameter Reported	MW360-3 06/27/90 11.5-12 ft	MW360-3 06/27/90 14.5-15 ft	MW360-4 06/27/90 1-1.5 ft	MW360-4 06/27/90 2.5-3 ft	MW360-4 06/27/90 4.5-5 ft	MW360-4 06/27/90 5-5.5 ft	MW360-4 06/27/90 8.5-9 ft
1,2-Dichlorobenzene (ug/kg)	<400	<400	<350	<390	<400	<460	<400
Phenanthrene (ug/kg)	<400	<400	230	<350	93	<460	<400
Anthracene (ug/kg)	<400	<400	44	<350	53	<460	<400
Fluoranthene (ug/kg)	<400	<400	320	<350	1400	<460	<400
Pyrene (ug/kg)	<400	<400	340	<350	1700	110	<400
Benzo(a)anthracene (ug/kg)	<400	<400	130	<350	550	<460	<400
Chrysene (ug/kg)	<400	<400	130	<350	680	<460	<400
bis(2-Ethylhexyl)phthalate (ug/kg)	64	87	<35.0	76	<400	150	92
Benzo(b)fluoranthene (ug/kg)	<400	<400	100	<350	590	<460	<400
Benzo(k)fluoranthene (ug/kg)	<400	<400	170	<350	760	<460	<400
Benzo(a)pyrene (ug/kg)	<400	<400	200	<350	900	73	<400
Indeno(1,2,3-cd)pyrene (ug/kg)	<400	<400	120	<350	570	<460	<400
Benzo(g,h,i)perylene (ug/kg)	<400	<400	130	<350	640	<460	<400

Notes: NA = Not Analyzed

< = Detection Limit

ug/kg = micrograms per kilogram

Data not validated by JMM

TABLE 8-4

SITE 4 - BUILDING 360, AIRCRAFT ENGINE FACILITY
RESULTS FOR SEMIVOLATILE COMPOUNDS DETECTED IN SOIL SAMPLES
 (Sheet 6 of 6)

Parameter Reported	MW360-4 06/27/90 14-14.5 ft
1,2-Dichlorobenzene (ug/kg)	<390
Phenanthrene (ug/kg)	<390
Anthracene (ug/kg)	<390
Fluoranthene (ug/kg)	<390
Pyrene (ug/kg)	<390
Benzo(a)anthracene (ug/kg)	<390
Chrysene (ug/kg)	<390
bis(2-Ethylhexyl)phthalate (ug/kg)	110
Benzo(b)fluoranthene (ug/kg)	<390
Benzo(k)fluoranthene (ug/kg)	<390
Benzo(a)pyrene (ug/kg)	<390
Indeno(1,2,3-cd)pyrene (ug/kg)	<390
Benzo(g,h,i)perylene (ug/kg)	<390

Notes: NA = Not Analyzed
 < = Detection Limit
 ug/kg = micrograms per kilogram
 Data not validated by JMM

TABLE 8-5

**SITE 4 - BUILDING 360, AIRCRAFT ENGINE FACILITY
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
(Sheet 1 of 9)**

Parameter Reported	B360-5 06/25/90 1-1.5 ft	B360-5 06/25/90 3-3.5 ft	B360-5 06/25/90 6-6.5 ft	B360-5 06/25/90 10-10.5 ft	B360-5 06/26/90 11.5-12 ft	B360-5 06/25/90 15-15.5 ft	B360-6 06/25/90 0.5-1 ft
Aluminum (mg/kg)	5230	4610	4640	8660	13000	7890	6920
Arsenic (mg/kg)	<2.60	<2.60	<2.80	<2.80	<2.90	3.7	<12.0
Barium (mg/kg)	35.2	44.5	25.5	49	80	73	56
Beryllium (mg/kg)	0.2	<0.200	<0.200	0.3	0.4	0.4	<1.20
Cadmium (mg/kg)	0.2	<0.200	<0.200	0.3	<0.200	<0.200	<1.20
Calcium (mg/kg)	3410	3840	2250	1780	1970	1940	7900
Chromium (mg/kg)	33.4	27.5	222	45.3	66	45.8	34
Cobalt (mg/kg)	5.4	5.2	3.4	11.4	6.7	6.9	12
Copper (mg/kg)	16.8	14.8	9.6	20.4	19.5	32.1	11
Iron (mg/kg)	8400	7390	6950	11800	17200	13500	10500
Lead (mg/kg)	<5.40	<5.50	<5.80	<5.80	<6.00	<5.90	37
Magnesium (mg/kg)	2500	2900	1860	2560	3640	3300	2800
Manganese (mg/kg)	107	139	80.2	231	149	161	160
Nickel (mg/kg)	28	26	24.4	31.9	60.9	49.3	28
Potassium (mg/kg)	850	625	580	870	750	530	1100
Silver (mg/kg)	<0.600	<0.600	<0.700	<0.700	<0.700	<0.700	<5.80
Sodium (mg/kg)	589	660	191	611	1440	1100	<580
Thallium (mg/kg)	<2.80	<2.80	<3.00	<3.00	<3.10	<3.10	<12.0
Titanium (mg/kg)	729	364	323	401	594	297	490
Vanadium (mg/kg)	19.7	18.4	17.1	27.1	34.6	24.4	24
Zinc (mg/kg)	27.4	23.8	25.1	27.2	37.4	40.1	34

Notes: NA = Not Analyzed

< = Detection Limit

mg/kg = milligrams per kilogram

Data not validated by JMM

TABLE 8-5

**SITE 4 - BUILDING 360, AIRCRAFT ENGINE FACILITY
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
(Sheet 2 of 9)**

Parameter Reported	B360-6 06/25/90 2.5-3 ft	B360-6 06/25/90 5.5-6 ft	B360-6 06/25/90 9-9.5 ft	B360-6 06/25/90 12-12.5 ft	B360-6 06/25/90 13.5-14 ft	B360-6R 06/25/90 1-1.5 ft	B360-7 06/26/90 1-1.5 ft
Aluminum (mg/kg)	6460	5680	16200	10700	10900	5600	6630
Arsenic (mg/kg)	<11.0	<12.0	17	15	15	<11.0	<11.0
Barium (mg/kg)	56	55	83	80	89	51	68
Beryllium (mg/kg)	<1.10	<1.20	<1.20	<1.20	<1.20	<1.10	<1.10
Cadmium (mg/kg)	<1.10	<1.20	<1.20	<1.20	<1.20	<1.10	<1.10
Calcium (mg/kg)	3400	3800	1800	2000	2400	3300	2600
Chromium (mg/kg)	31	120	51	40	45	29	30
Cobalt (mg/kg)	<5.50	<5.80	<6.00	6.9	7.7	<5.40	<5.40
Copper (mg/kg)	14	9.7	17	11	11	15	7.9
Iron (mg/kg)	9910	8530	17900	15500	16900	8850	9520
Lead (mg/kg)	17	13	8.5	8.2	7.4	14	8.8
Magnesium (mg/kg)	2100	2100	4000	3600	4000	2200	2200
Manganese (mg/kg)	160	150	140	180	230	130	140
Nickel (mg/kg)	22	21	46	48	55	23	25
Potassium (mg/kg)	860	700	710	840	1000	790	970
Silver (mg/kg)	<5.50	<5.80	<6.00	<6.00	<5.90	<5.40	<5.40
Sodium (mg/kg)	<550	<580	<600	<600	<590	<540	<540
Thallium (mg/kg)	<11.0	<12.0	<12.0	<12.0	<12.0	<11.0	<11.0
Titanium (mg/kg)	440	450	550	510	520	400	450
Vanadium (mg/kg)	22	22	36	30	31	21	23
Zinc (mg/kg)	34	27	30	29	31	29	21

Notes: NA = Not Analyzed
 < = Detection Limit
 mg/kg = milligrams per kilogram
 Data not validated by JMM

TABLE 8-5

**SITE 4 - BUILDING 360, AIRCRAFT ENGINE FACILITY
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
(Sheet 3 of 9)**

Parameter Reported	B360-7 06/26/90 3-3.5 ft	B360-7 06/26/90 5.5-6 ft	B360-7 06/26/90 9-9.5 ft	B360-7 06/26/90 9.5-10 ft	B360-7 06/26/90 11.5-12 ft	B360-7 06/26/90 15-15.5 ft	B360-8 07/08/90 1-1.5 ft
Aluminum (mg/kg)	5800	6610	14400	14000	13800	10900	7030
Arsenic (mg/kg)	<11.0	<13.0	15	<12.0	<12.0	<12.0	<2.60
Barium (mg/kg)	46	47	70	90	90	87	62.5
Beryllium (mg/kg)	<1.10	<1.30	<1.20	<1.20	<1.20	<1.20	0.2
Cadmium (mg/kg)	<1.10	<1.30	<1.20	<1.20	<1.20	<1.20	<0.200
Calcium (mg/kg)	3900	2400	1900	1700	2100	2400	2810
Chromium (mg/kg)	30	31	48	41	38	50	37.1
Cobalt (mg/kg)	<5.50	<6.50	7.8	<6.20	7.4	7.7	5.4
Copper (mg/kg)	16	9.4	12	12	27	15	13.2
Iron (mg/kg)	8930	10200	18500	16000	17800	16600	9360
Lead (mg/kg)	9.4	7.6	8.9	9.4	<6.20	<6.10	8.2
Magnesium (mg/kg)	2500	2900	4000	3800	4100	4400	1960
Manganese (mg/kg)	120	120	220	170	170	180	175
Nickel (mg/kg)	28	31	51	50	58	55	25.8
Potassium (mg/kg)	920	1100	750	820	1100	920	942
Silver (mg/kg)	<5.50	<6.50	<5.90	<6.20	<6.20	<6.10	<0.700
Sodium (mg/kg)	<550	<650	<590	<620	<620	<610	150
Thallium (mg/kg)	<11.0	<13.0	<12.0	<12.0	<12.0	<12.0	<2.80
Titanium (mg/kg)	450	530	530	510	611	450	439
Vanadium (mg/kg)	21	24	38	30	33	28	22.7
Zinc (mg/kg)	24	24	30	30	38	33	28.9

Notes: NA = Not Analyzed
 < = Detection Limit
 mg/kg = milligrams per kilogram
 Data not validated by JMM

TABLE 8-5

**SITE 4 - BUILDING 360, AIRCRAFT ENGINE FACILITY
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
(Sheet 4 of 9)**

Parameter Reported	B360-8 07/08/90 3-3.5 ft	B360-8 07/08/90 5.5-6 ft	B360-8 07/08/90 9-9.5 ft	B360-8 06/26/90 12-12.5 ft	B360-8 07/08/90 15-15.5 ft	B360-9 07/08/90 0.5-1 ft	B360-9 07/08/90 2.5-3 ft
Aluminum (mg/kg)	7100	4410	1080	9430	7080	5050	4310
Arsenic (mg/kg)	<2.80	<2.80	<2.80	4.4	3.9	<2.60	4.4
Barium (mg/kg)	124	37.7	74.6	74.6	72.3	43.1	173
Beryllium (mg/kg)	0.3	<0.200	0.4	0.4	0.3	<0.200	0.3
Cadmium (mg/kg)	<0.200	0.2	0.4	0.3	<0.200	0.3	0.3
Calcium (mg/kg)	2930	1160	2210	2220	1810	4970	9640
Chromium (mg/kg)	33.4	29.7	47	42.6	37.9	31.9	19.8
Cobalt (mg/kg)	6.4	4.5	6.8	7	6.8	17.7	4.2
Copper (mg/kg)	29.6	14.3	43.7	11.6	10.9	14.5	55.8
Iron (mg/kg)	10300	7580	15100	15200	12300	8490	13500
Lead (mg/kg)	51.2	<5.80	<5.90	<6.00	<6.00	6.5	1460
Magnesium (mg/kg)	2210	1420	3520	3640	3240	2430	1660
Manganese (mg/kg)	300	138	188	174	172	119	200
Nickel (mg/kg)	24.6	16	54.6	51	43.5	27.4	17
Potassium (mg/kg)	1190	629	646	901	569	785	840
Silver (mg/kg)	<0.700	<0.700	<0.700	<0.700	<0.700	<0.700	<0.700
Sodium (mg/kg)	208	168	512	337	311	295	618
Thallium (mg/kg)	<3.10	<3.00	<3.00	<3.10	3.1	<2.80	<2.90
Titanium (mg/kg)	408	318	464	482	353	322	197
Vanadium (mg/kg)	23	19	27.2	28.1	23.2	18.8	14.8
Zinc (mg/kg)	81.5	21	42.5	31.1	30.1	34.6	118

Notes: NA = Not Analyzed
 < = Detection Limit
 mg/kg = milligrams per kilogram
 Data not validated by JMM

TABLE 8-5

**SITE 4 - BUILDING 360, AIRCRAFT ENGINE FACILITY
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
(Sheet 5 of 9)**

Parameter Reported	B360-9 07/08/90 5.5-6 ft	B360-9 07/08/90 9.5-10 ft	B360-9 07/08/90 12-12.5 ft	B360-9 07/08/90 15.5-16 ft	MW360-1 06/28/90 0.5-1 ft	MW360-1 06/28/90 3-3.5 ft	MW360-1 06/28/90 5.5-6 ft
Aluminum (mg/kg)	5170	8370	12700	6210	7560	3570	6050
Arsenic (mg/kg)	3.6	<2.80	3.8	3	<2.70	<2.50	3.6
Barium (mg/kg)	48.6	53.1	86.9	70.4	45.6	70.4	72
Beryllium (mg/kg)	<0.200	0.3	0.4	0.3	0.3	<0.200	<0.200
Cadmium (mg/kg)	<0.200	<0.200	0.7	<0.200	0.2	<0.200	0.3
Calcium (mg/kg)	1800	1750	2070	1540	2230	2430	25000
Chromium (mg/kg)	32.2	42.3	63	34	62.6	26.8	34.6
Cobalt (mg/kg)	4.2	5.3	6.6	6.9	6.6	3.3	4
Copper (mg/kg)	22.4	22.1	14.3	9.5	10.5	4.4	18.3
Iron (mg/kg)	8890	12100	17200	11300	11800	6030	8000
Lead (mg/kg)	<6.20	<6.00	<5.90	<6.00	<5.50	<5.20	22.1
Magnesium (mg/kg)	1670	2930	3950	3010	2780	1800	2100
Manganese (mg/kg)	361	141	141	177	125	72	117
Nickel (mg/kg)	20	35.8	56	42.9	44.6	23.6	19.3
Potassium (mg/kg)	800	695	852	690	965	523	1160
Silver (mg/kg)	<0.700	<0.700	0.7	<0.700	<0.700	<0.600	<0.800
Sodium (mg/kg)	285	338	424	316	575	385	688
Thallium (mg/kg)	<3.20	<3.10	<3.10	<3.10	<2.90	<2.70	<3.30
Titanium (mg/kg)	345	391	637	331	365	302	424
Vanadium (mg/kg)	18.9	25	34.7	21.1	26.5	16	21.3
Zinc (mg/kg)	26.9	37.6	36.2	25.1	31.4	18.7	38.8

Notes: NA = Not Analyzed
 < = Detection Limit
 mg/kg = milligrams per kilogram
 Data not validated by JMM

TABLE 8-5

SITE 4 - BUILDING 360, AIRCRAFT ENGINE FACILITY
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
 (Sheet 6 of 9)

Parameter Reported	MW360-1 06/28/90 9-9.5 ft	MW360-1 06/28/90 12-12.5 ft	MW360-1 06/28/90 15-15.5 ft	MW360-2 06/28/90 1-1.5 ft	MW360-2 06/28/90 3-3.5 ft	MW360-2 06/28/90 7.5-8 ft	MW360-2 06/28/90 9-9.5 ft
Aluminum (mg/kg)	5410	9777	8027	5782	5882	14470	13900
Arsenic (mg/kg)	<2.90	3	5.1	<2.70	<2.70	<2.80	3
Barium (mg/kg)	37.8	25.6	109.9	63.2	62.2	78.4	79.9
Beryllium (mg/kg)	<0.200	0.3	0.4	0.2	0.2	0.5	0.5
Cadmium (mg/kg)	<0.200	<0.200	0.4	0.3	<0.200	<0.200	<0.200
Calcium (mg/kg)	1070	1540	1484	4377	2263	2316	2440
Chromium (mg/kg)	28.4	38.3	38.4	33.1	33.4	56.8	55.7
Cobalt (mg/kg)	4.4	6.5	9	5	6.1	6.2	6.9
Copper (mg/kg)	7.9	19.4	14.3	12.9	9.3	11.6	10.6
Iron (mg/kg)	8870	14070	14660	8855	103	15860	15900
Lead (mg/kg)	<6.10	<6.00	<6.10	7.2	<5.60	<5.80	<5.90
Magnesium (mg/kg)	2310	2929	3208	2333	3173	3670	3800
Manganese (mg/kg)	135	127	145.3	127.8	127.2	161.1	167
Nickel (mg/kg)	24.5	44.5	59.7	25.9	36.6	48.8	47.3
Potassium (mg/kg)	550	834	1012	822	1070	1108	1110
Silver (mg/kg)	<0.700	<0.700	<0.700	<0.700	<0.700	<0.700	<0.700
Sodium (mg/kg)	765	1368	1407	233	265	366	380
Thallium (mg/kg)	<3.20	<3.10	<3.20	<2.90	<2.90	<3.00	<3.10
Titanium (mg/kg)	247	472	386.4	377	330	597	603
Vanadium (mg/kg)	19.5	26.3	29.8	19.2	20.4	34.5	34.8
Zinc (mg/kg)	20.5	40	37.4	30.8	35.2	32.6	32.7

Notes: NA = Not Analyzed
 < = Detection Limit
 mg/kg = milligrams per kilogram
 Data not validated by JMM

TABLE 8-5

**SITE 4 - BUILDING 360, AIRCRAFT ENGINE FACILITY
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
(Sheet 7 of 9)**

Parameter Reported	MW360-2 06/27/90 12-12.5 ft	MW360-2 06/28/90 15-15.5 ft	MW360-3 06/27/90 1-1.5 ft	MW360-3 06/27/90 3-3.5 ft	MW360-3 06/27/90 5.5-6 ft	MW360-3 06/27/90 9-9.5 ft	MW360-3 06/27/90 12-12.5 ft
Aluminum (mg/kg)	8260	10910	3920	7460	4100	10800	9580
Arsenic (mg/kg)	<2.80	6.1	<11.0	<13.0	<12.0	<12.0	<12.0
Barium (mg/kg)	89.1	102	36	59	40	75	66
Beryllium (mg/kg)	0.3	0.4	<1.10	<1.30	<1.20	<1.20	<1.20
Cadmium (mg/kg)	<0.200	0.4	<1.10	<1.30	<1.20	<1.20	<1.20
Calcium (mg/kg)	1839	2508	2900	3100	980	1900	1700
Chromium (mg/kg)	36.7	56.8	23	40	22	38	35
Cobalt (mg/kg)	6.5	9.8	<5.30	7.6	<6.10	7.5	7.5
Copper (mg/kg)	9.8	14.7	7.4	14	15	10	15
Iron (mg/kg)	13000	19000	6640	12800	7770	15700	15500
Lead (mg/kg)	<5.90	<7.00	<5.30	<6.40	<6.10	<6.00	<6.20
Magnesium (mg/kg)	2340	4415	2000	4200	1500	3500	3800
Manganese (mg/kg)	135	227	80	130	130	240	190
Nickel (mg/kg)	43.7	64.8	23	47	17	52	54
Potassium (mg/kg)	722	1086	600	1200	<610	970	790
Silver (mg/kg)	<0.700	<0.800	<5.30	<6.40	<6.10	<6.00	<6.20
Sodium (mg/kg)	378	446	<530	<640	<610	720	660
Thallium (mg/kg)	<3.10	<3.60	<11.0	<13.0	<12.0	<12.0	<12.0
Titanium (mg/kg)	452	532.3	320	460	320	470	430
Vanadium (mg/kg)	24.7	36.1	16	28	18	29	28
Zinc (mg/kg)	29.3	38.4	18	33	20	31	32

Notes: NA = Not Analyzed
 < = Detection Limit
 mg/kg = milligrams per kilogram
 Data not validated by JMM

TABLE 8-5

**SITE 4 - BUILDING 360, AIRCRAFT ENGINE FACILITY
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
(Sheet 8 of 9)**

Parameter Reported	MW360-3 06/27/90 15-15.5 ft	MW360-4 06/27/90 1-1.5 ft	MW360-4 06/27/90 3-3.5 ft	MW360-4 06/27/90 4.5-5 ft	MW360-4 06/27/90 5.5-6 ft	MW360-4 06/27/90 9-9.5 ft	MW360-4 06/27/90 12-12.5 ft
Aluminum (mg/kg)	8970	4510	2870	3420	4590	10500	12400
Arsenic (mg/kg)	<12.0	<10.0	<11.0	<12.0	<12.0	<12.0	<12.0
Barium (mg/kg)	70	25	46	<24.0	65	76	79
Beryllium (mg/kg)	<1.20	<1.00	<1.10	<1.20	<1.20	<1.20	<1.20
Cadmium (mg/kg)	<1.20	<1.00	<1.10	<1.20	<1.20	<1.20	<1.20
Calcium (mg/kg)	2000	2200	1000	1300	1400	1300	1900
Chromium (mg/kg)	42	28	22	21	23	40	42
Cobalt (mg/kg)	7.3	<5.20	<5.50	<6.00	<5.80	7.2	7
Copper (mg/kg)	13	7.5	<5.50	27	6.7	12	12
Iron (mg/kg)	15000	7890	5450	6040	8360	17500	16600
Lead (mg/kg)	<6.10	12	<5.50	<6.00	<5.80	<6.10	<6.20
Magnesium (mg/kg)	3500	1900	1500	1700	1500	3700	3800
Manganese (mg/kg)	170	120	73	76	150	220	220
Nickel (mg/kg)	46	24	22	21	20	45	53
Potassium (mg/kg)	840	590	<550	<600	670	<610	840
Silver (mg/kg)	<6.10	<5.20	<5.50	<6.00	<5.80	<6.10	<6.20
Sodium (mg/kg)	<610	<520	<550	<600	<580	<610	<620
Thallium (mg/kg)	<12.0	<10.0	<11.0	<12.0	<12.0	<12.0	<12.0
Titanium (mg/kg)	420	330	250	270	320	388	550
Vanadium (mg/kg)	29	19	13	14	19	36	31
Zinc (mg/kg)	32	22	14	24	19	27	34

Notes: NA = Not Analyzed
 < = Detection Limit
 mg/kg = milligrams per kilogram
 Data not validated by JMM

TABLE 8-5

**SITE 4 - BUILDING 360, AIRCRAFT ENGINE FACILITY
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
(Sheet 9 of 9)**

Parameter Reported	MW360-4 06/27/90 14.5-15 ft
Aluminum (mg/kg)	11200
Arsenic (mg/kg)	<12.0
Barium (mg/kg)	81
Beryllium (mg/kg)	<1.20
Cadmium (mg/kg)	<1.20
Calcium (mg/kg)	2200
Chromium (mg/kg)	42
Cobalt (mg/kg)	7
Copper (mg/kg)	16
Iron (mg/kg)	15500
Lead (mg/kg)	<6.10
Magnesium (mg/kg)	3600
Manganese (mg/kg)	190
Nickel (mg/kg)	52
Potassium (mg/kg)	1000
Silver (mg/kg)	<6.10
Sodium (mg/kg)	<610
Thallium (mg/kg)	<12.0
Titanium (mg/kg)	550
Vanadium (mg/kg)	29
Zinc (mg/kg)	32

Notes: NA = Not Analyzed
 < = Detection Limit
 mg/kg = milligrams per kilogram
 Data not validated by JMM

TABLE 8-6

SITE 4 - BUILDING 360, AIRCRAFT ENGINE FACILITY
RESULTS FOR GENERAL CHEMICAL CHARACTERISTICS IN SOIL SAMPLES
(Sheet 1 of 2)

Parameter Reported	B360-5 06/25/90 3-3.5 ft	B360-6 06/25/90 2.5-3 ft	B360-6R 06/25/90 1-1.5 ft	B360-7 06/26/90 3-3.5 ft	B360-8 07/08/90 3-3.5 ft	B360-9 07/08/90 2.5-3 ft	MW360-1 06/28/90 3-3.5 ft
Characteristic Measurements							
pH (Units)	10	8.3	8.4	8.3	8.1	9	9.7
	B360-8 07/08/90 1-1.5 ft	B360-8 07/08/90 3-3.5 ft	B360-8 07/08/90 5.5-6 ft	B360-8 07/08/90 9-9.5 ft	B360-8 06/26/90 12-12.5 ft	B360-9 07/08/90 0.5-1 ft	MW360-2 06/27/90 12-12.5 ft
Miscellaneous Measurements							
Cyanide (mg/kg)	0.72	0.59	0.58	0.74	1.11	0.55	0.67
	B360-5 06/25/90 1.5-2 ft	B360-6 06/25/90 3.5-4 ft	B360-6R 06/25/90 1.5-2 ft	B360-7 06/26/90 1.5-2 ft	B360-8 07/08/90 1.5-2 ft	B360-9 07/08/90 1.5-2 ft	MW360-1 06/28/90 1-1.5 ft
Total Organic Carbon							
Total Organic Carbon (mg/kg)	438	2890	2740	1900	243	292	243

Notes: NA = Not Analyzed
< = Detection Limit
mg/kg = milligrams per kilogram
Data not validated by JMM

TABLE 8-6

SITE 4 - BUILDING 360, AIRCRAFT ENGINE FACILITY
RESULTS FOR GENERAL CHEMICAL CHARACTERISTICS IN SOIL SAMPLES
 (Sheet 2 of 2)

	MW360-2	MW360-3	MW360-4	
	06/28/90	06/27/90	06/27/90	
Parameter Reported	3-3.5 ft	3-3.5 ft	3-3.5 ft	
Characteristic Measurements				
pH (Units)	9	8.8	7.8	
	B360-5	B360-6	B360-6R	MW360-4
	06/25/90	06/25/90	06/25/90	06/27/90
Parameter Reported	1.5-2 ft	3.5-4 ft	1.5-2 ft	1-1.5 ft
Cations/Anions				
Cation Exchange Capacity (meq/hg)	4.4	5.28	4.64	4.16
	MW360-2	MW360-3	MW360-4	
	06/28/90	06/27/90	06/27/90	
Parameter Reported	1.5-2 ft	1-1.5 ft	1-1.5 ft	
Total Organic Carbon				
Total Organic Carbon (mg/kg)	2050	390	1070	

Notes: NA = Not Analyzed
 < = Detection Limit
 mg/kg = milligrams per kilogram
 meq/hg = milliequivalents per inch of mercury
 Data not validated by JMM

TABLE 8-7

SITE 4 - BUILDING 360, AIRCRAFT ENGINE FACILITY
RESULTS FOR VOLATILE AND SEMIVOLATILE ORGANIC COMPOUNDS DETECTED IN GROUNDWATER SAMPLES

Parameter Reported	200 08/03/90 0-0 ft	200 07/10/90 0-0 ft	201 07/11/90 0-0 ft	MW360-1 07/11/90 0-0 ft	MW360-2 07/11/90 0-0 ft	MW360-3 07/10/90 0-0 ft	MW360-4 08/03/90 0-0 ft
Volatile Organic Compounds							
Vinyl Chloride (ug/L)	<10.0	<10.0	<10.0	<500	<200	<10.0	140
Methylene Chloride (ug/L)	5	14	27	1300	520	15	190
1,1-Dichloroethene (ug/L)	<5.00	<5.00	<5.00	<250	320	<5.00	<50
1,1-Dichloroethane (ug/L)	<5.00	<5.00	<5.00	<250	230	<5.00	<50
1,2-Dichloroethene (total) (ug/L)	<5.00	<5.00	<5.00	<250	<100	<5.00	680
1,1,1-Trichloroethane (ug/L)	<5.00	10	<5.00	<250	920	<5.00	<50
Trichloroethene (ug/L)	<5.00	<5.00	<5.00	4900	120	<5.00	2100
Benzene (ug/L)	<5.00	8	<5.00	<250	<100	<5.00	<50
	MW360-2 07/11/90 0-0 ft	MW360-4 08/03/90 0-0 ft					
Semivolatile Compounds							
1,4-Dichlorobenzene (ug/L)	15	21					
1,2-Dichlorobenzene (ug/L)	51	120					
n-Nitroso-di-phenylamine (ug/L)	<10.0	3					
bis(2-Ethylhexyl)phthalate (ug/L)	<10.0	4					

Notes: NA = Not Analyzed

< = Detection Limit

ug/L = micrograms per liter

Data not validated by JMM

200-series numbers as well as boring name indicate a travel blank

TABLE 8-8

**SITE 4 - BUILDING 360, AIRCRAFT ENGINE FACILITY
RESULTS FOR METALS DETECTED IN GROUNDWATER SAMPLES**

Parameter Reported	MW360-1 07/11/90 0-0 ft	MW360-2 07/11/90 0-0 ft	MW360-3 07/10/90 0-0 ft	MW360-4 08/03/90 0-0 ft
Aluminum (mg/L)	165	15	2.3	397
Arsenic (mg/L)	0.17	<0.050	<0.050	0.12
Barium (mg/L)	1.1	0.43	<0.200	1.6
Beryllium (mg/L)	<0.005	<0.005	<0.005	0.008
Calcium (mg/L)	27	63	9.7	55
Chromium (mg/L)	0.44	0.032	<0.010	1.1
Cobalt (mg/L)	0.088	<0.050	<0.050	0.19
Copper (mg/L)	0.15	<0.025	<0.025	0.28
Iron (mg/L)	184	13	1.9	461
Lead (mg/L)	0.082	<0.050	<0.050	0.09
Magnesium (mg/L)	55	22	8.3	119
Manganese (mg/L)	2.4	0.63	0.47	5.4
Nickel (mg/L)	1.7	0.067	<0.040	1.4
Potassium (mg/L)	18	<5.00	<5.00	29
Selenium (mg/L)	<0.050	<0.050	<0.050	0.11
Silver (mg/L)	<0.010	<0.010	<0.010	0.011
Sodium (mg/L)	842	177	125	199
Titanium (mg/L)	4.3	0.37	<0.050	8.6
Vanadium (mg/L)	0.37	0.055	<0.050	0.8
Zinc (mg/L)	0.36	0.08	0.025	0.79

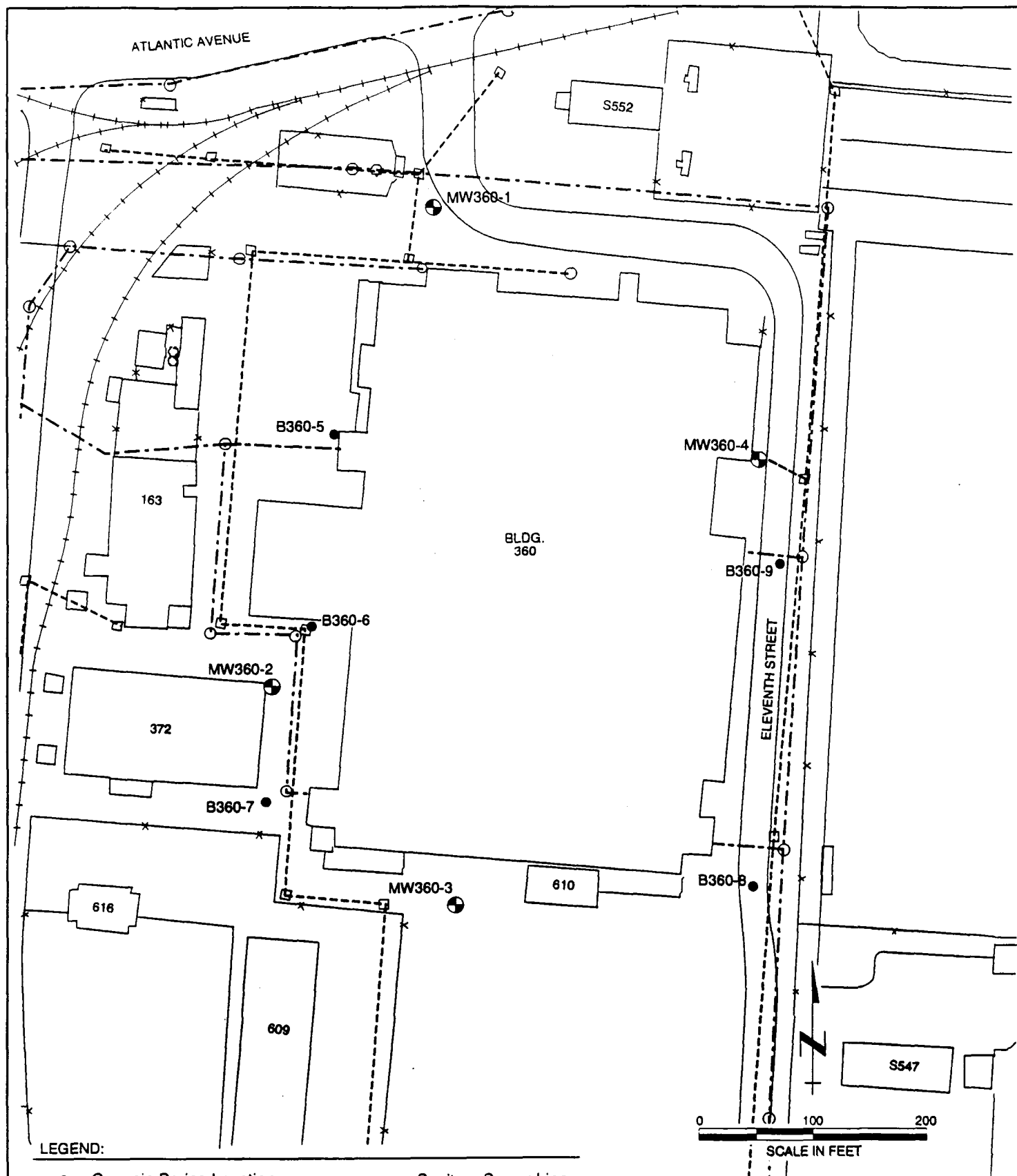
Notes: NA = Not Analyzed
 < = Detection Limit
 mg/L = milligrams per liter
 Data not validated by JMM

TABLE 8-9

**SITE 4 - BUILDING 360, AIRCRAFT ENGINE FACILITY
RESULTS FOR GENERAL CHEMICAL CHARACTERISTICS IN GROUNDWATER SAMPLES**

Parameter Reported	MW360-1 07/11/90 0-0 ft	MW360-2 07/11/90 0-0 ft	MW360-3 07/10/90 0-0 ft	MW360-4 08/03/90 0-0 ft
Miscellaneous Measurements				
Alkalinity, bicarb (as CaCO ₃) (mg/L)	1000	390	732	340
Alkalinity, total (as CaCO ₃) (mg/L)	1000	390	732	340
Chloride (mg/L)	546	125	54	125
Sulfate (mg/L)	175	47	72	83
Total Dissolved Solids (mg/L)	3180	980	1510	1110
Total Hardness (as CaCO ₃) (mg/L)	398	466	483	627
Characteristic Measurements				
Dissolved Oxygen (mg/L)	2.1	2.35	2.1	4
pH (Units)	7.3	7.3	7.4	7.6
Cations/Anions				
Specific Conductivity (umhos)	3950	1210	1590	1140
Hydrocarbon Compounds				
TRPH (mg/L)	0.22	1.28	0.14	0.09
Total Organic Carbon				
Total Organic Carbon (mg/L)	27.3	24.5	38.8	14.1

Notes: NA = Not Analyzed
 < = Detection Limit
 mg/L = milligrams per liter
 umhos = micromhos per centimeter
 Data not validated by JMM

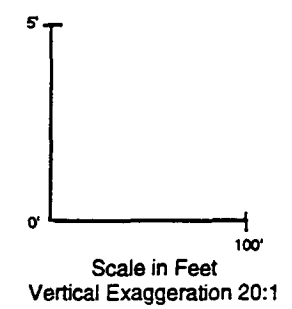
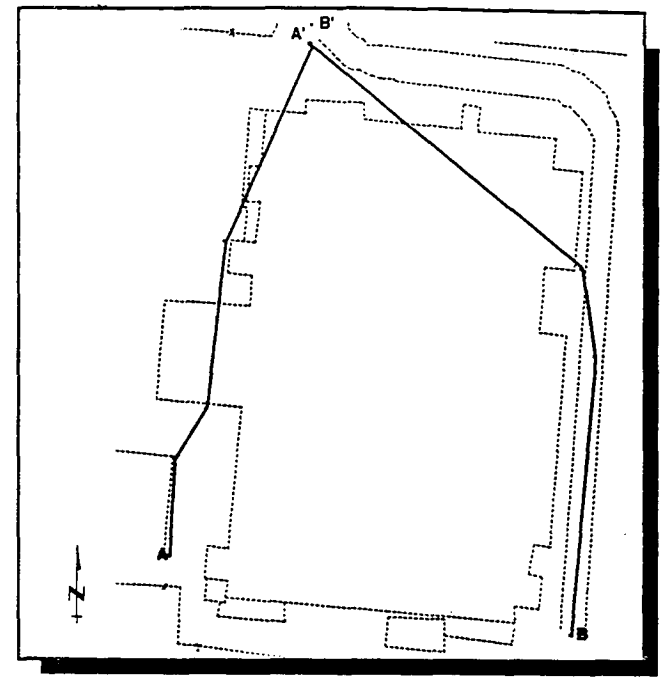
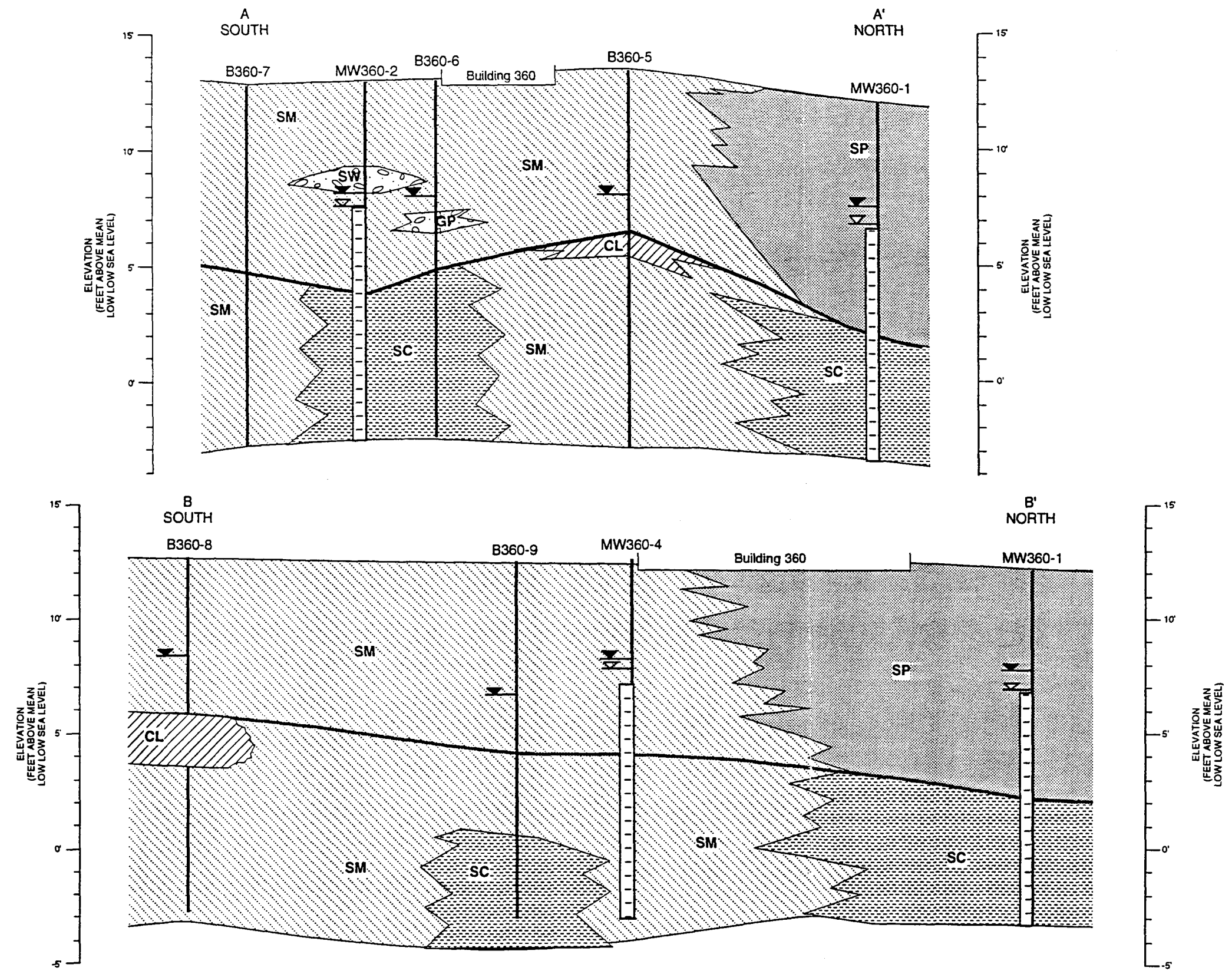


NOTE: Boring and monitoring well locations were obtained from a base map provided by Canonie Environmental, Inc. The individual locations were digitized onto a base map CAD file provided by NAS Alameda.

P182A-A-21

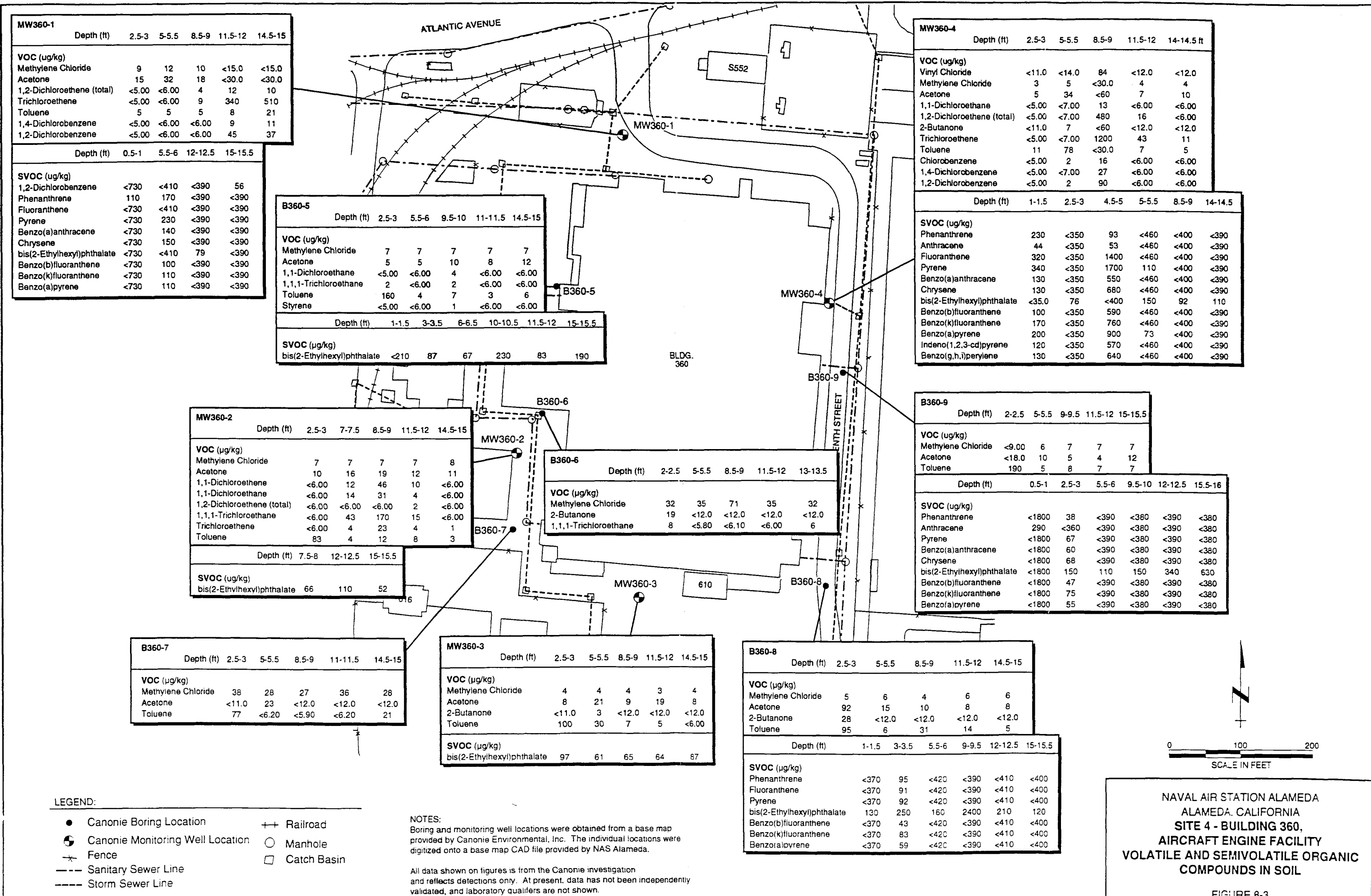
NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
**SITE 4 - BUILDING 360,
AIRCRAFT ENGINE FACILITY
CANONIE BORING AND MONITORING
WELL LOCATIONS**

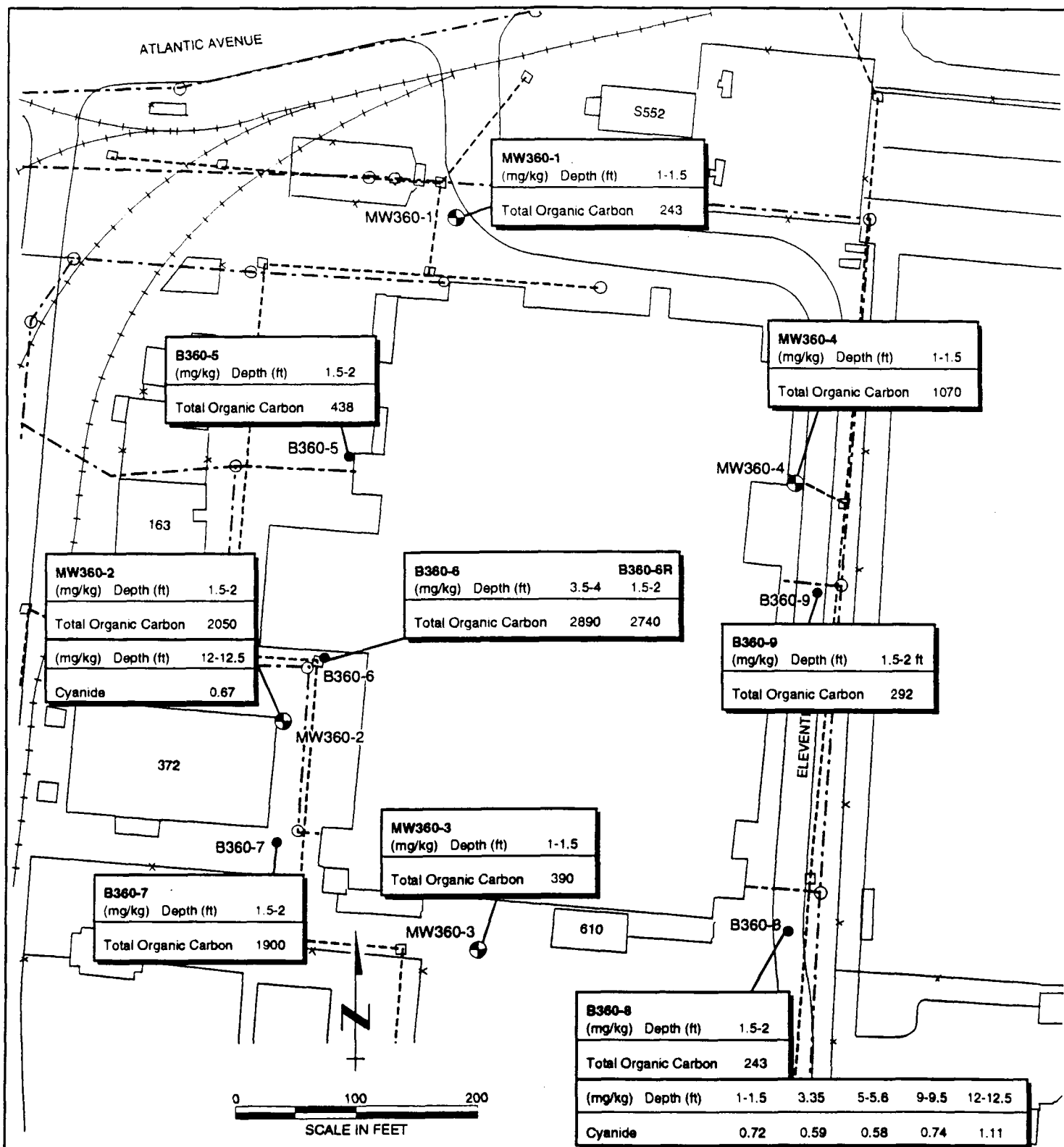
FIGURE 8-1



NAVAL AIR STATION ALAMEDA
 ALAMEDA, CALIFORNIA
 SITE 4 - BUILDING 360,
 AIRCRAFT ENGINE FACILITY
 GEOLOGIC CROSS SECTION A-A', B-B'

FIGURE 8-2





LEGEND:

- Canone Boring Location
- ⊕ Canone Monitoring Well Location
- ✕ Fence
- Sanitary Sewer Line
- Storm Sewer Line
- ⦶ Railroad
- Manhole
- Catch Basin

NOTES:

Boring and monitoring well locations were obtained from a base map provided by Canone Environmental, Inc. The individual locations were digitized onto a base map CAD file provided by NAS Alameda.

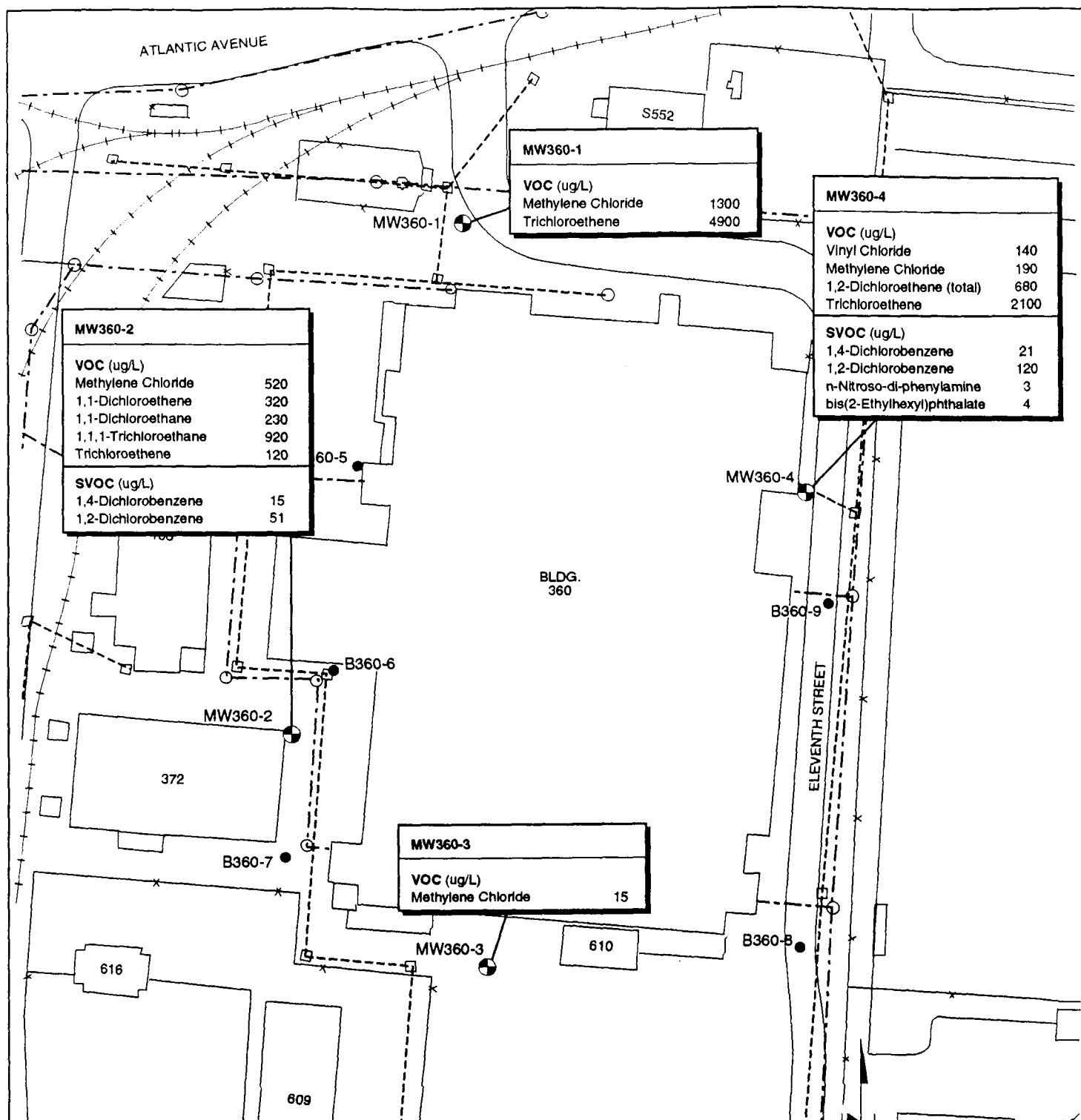
All data shown on figures is from the Canone investigation and reflects detections only.

At present, data has not been independently validated, and laboratory qualifiers are not shown.

P182AA-21

**NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
SITE 4 - BUILDING 360,
AIRCRAFT ENGINE FACILITY
TOTAL ORGANIC CARBON AND CYANIDE
IN SOIL**

FIGURE 8-4



LEGEND:

- Canone Boring Location
- ⊕ Canone Monitoring Well Location
- ✕ Fence
- Sanitary Sewer Line
- Storm Sewer Line
- ⋈ Railroad
- Manhole
- Catch Basin

NOTES:

Boring and monitoring well locations were obtained from a base map provided by Canone Environmental, Inc. The individual locations were digitized onto a base map CAD file provided by NAS Alameda.

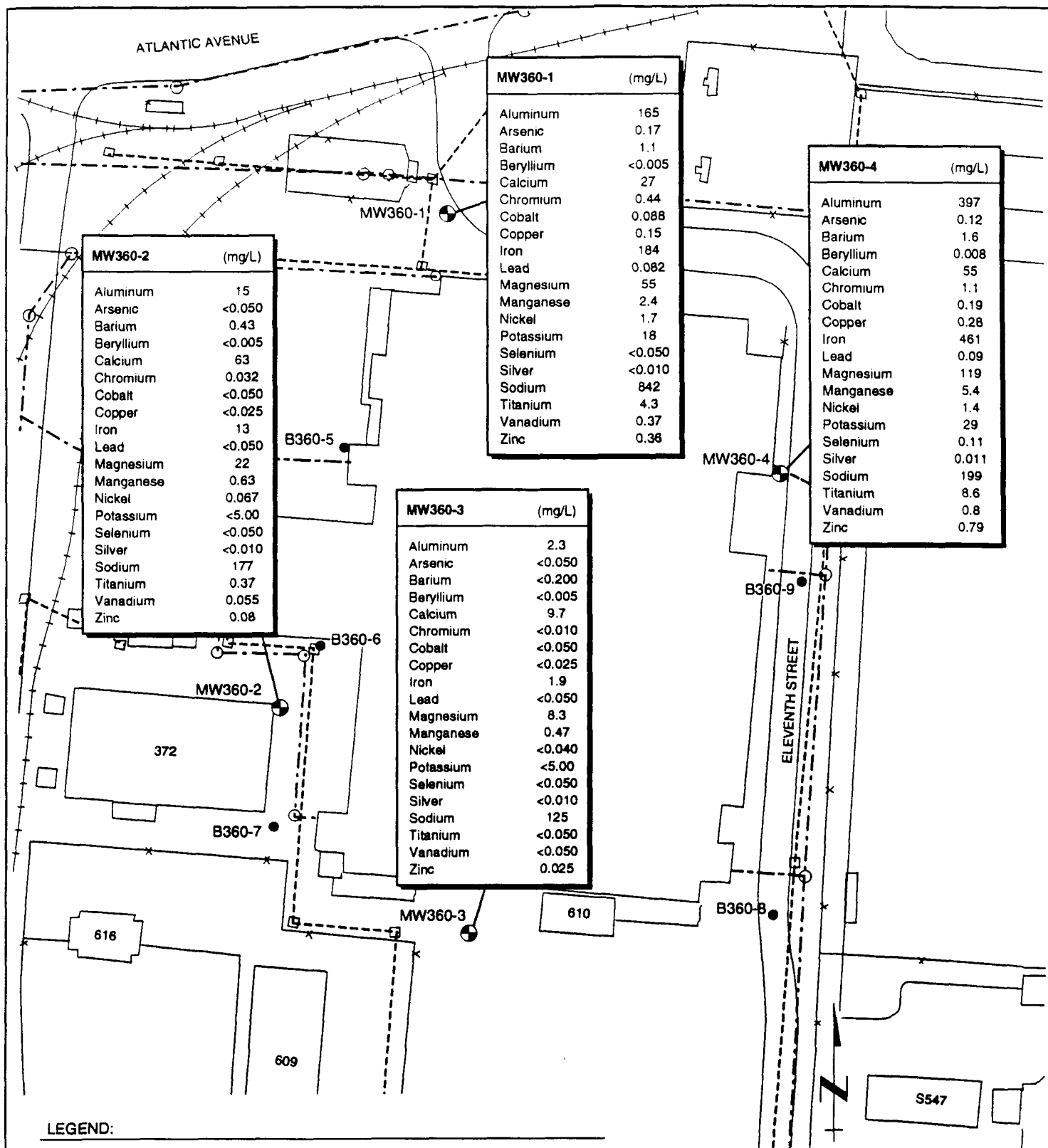
All data shown on figures is from the Canone investigation and reflects detections only. At present, data has not been independently validated, and laboratory qualifiers are not shown.

P1&2A.A-21

0 100 200
SCALE IN FEET

NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
SITE 4 - BUILDING 360,
AIRCRAFT ENGINE FACILITY
VOLATILE AND SEMIVOLATILE ORGANIC
COMPOUNDS IN GROUNDWATER

FIGURE 8-5



LEGEND:

- Canolie Boring Location
- ⊙ Canolie Monitoring Well Location
- ✱ Fence
- Sanitary Sewer Line
- Storm Sewer Line
- ⊕ Railroad
- ⊕ Manhole
- ⊕ Catch Basin

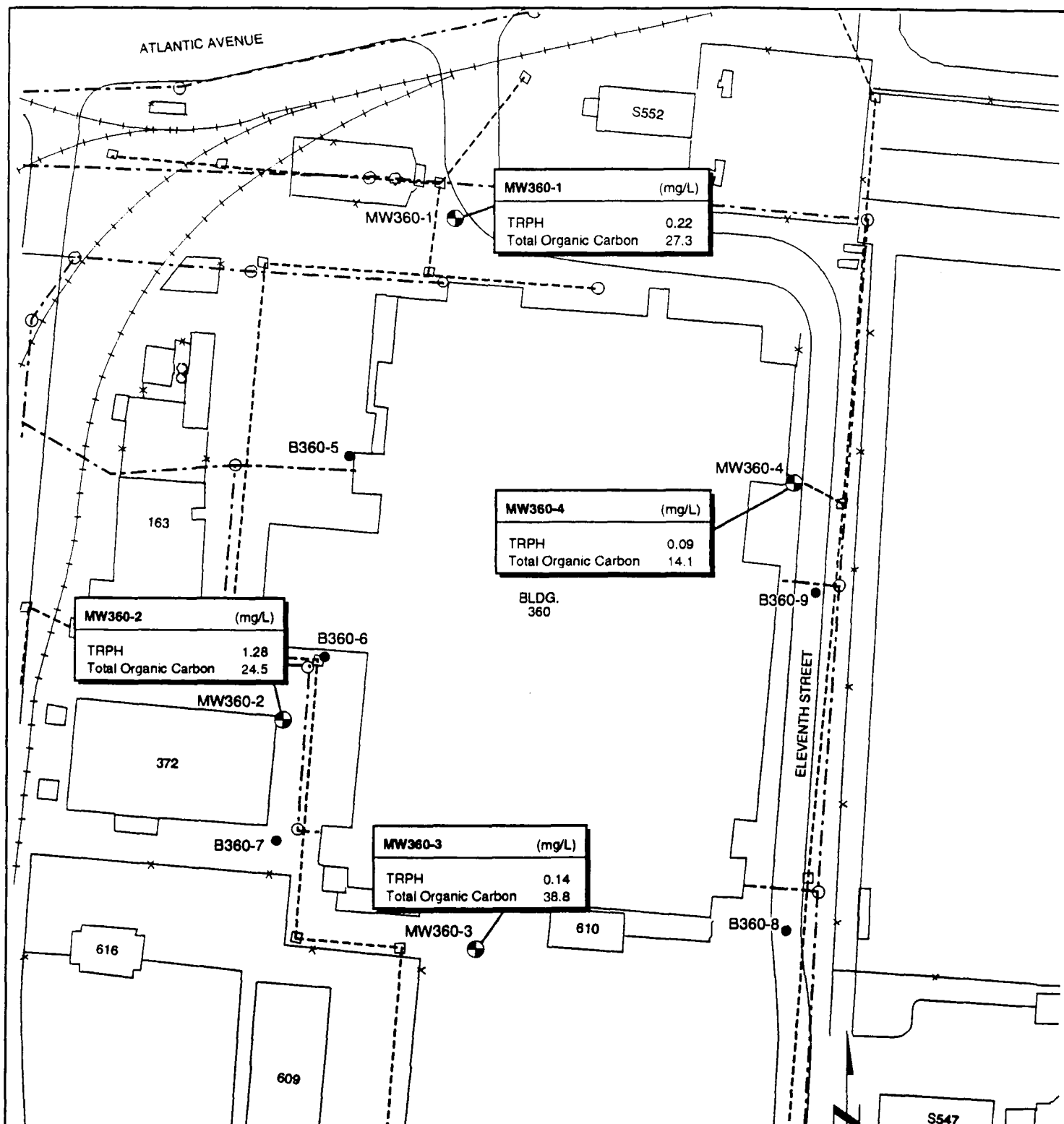
NOTES:

Boring and monitoring well locations were obtained from a base map provided by Canolie Environmental, Inc. The individual locations were digitized onto a base map CAD file provided by NAS Alameda.

All data shown on figures is from the Canolie investigation and reflects detections only. At present, data has not been independently validated, and laboratory qualifiers are not shown.

NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
**SITE 4 - BUILDING 360,
AIRCRAFT ENGINE FACILITY
METALS IN GROUNDWATER**

FIGURE 8-6



LEGEND:

- Canone Boring Location
- ⊙ Canone Monitoring Well Location
- ✕ Fence
- Sanitary Sewer Line
- Storm Sewer Line
- ⋈ Railroad
- Manhole
- Catch Basin

NOTES:

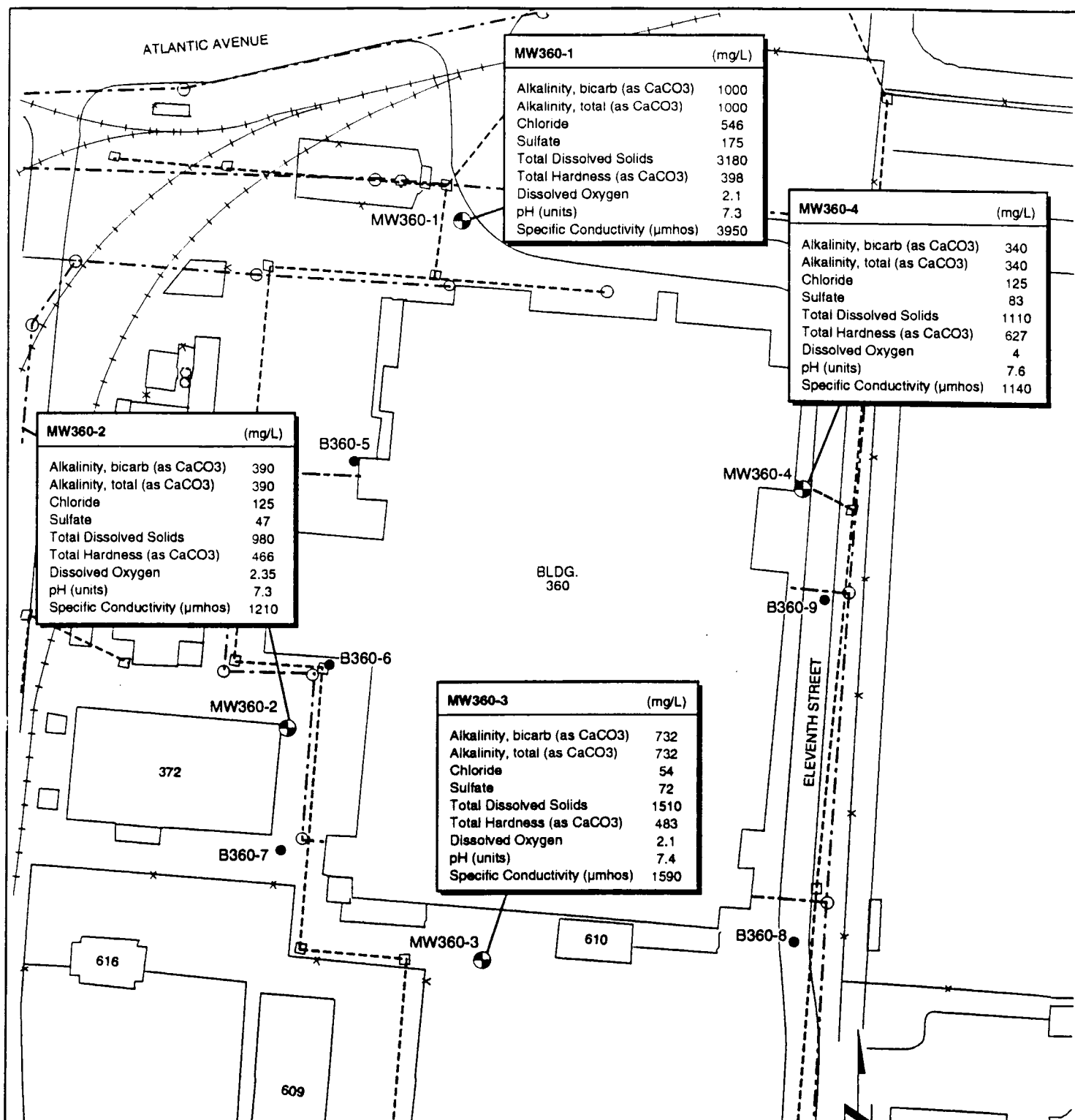
Boring and monitoring well locations were obtained from a base map provided by Canone Environmental, Inc. The individual locations were digitized onto a base map CAD file provided by NAS Alameda.

All data shown on figures is from the Canone investigation and reflects detections only. At present, data has not been independently validated, and laboratory qualifiers are not shown.

0 100 200
SCALE IN FEET

NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
SITE 4 - BUILDING 360,
AIRCRAFT ENGINE FACILITY
TRPH AND TOTAL ORGANIC CARBON
IN GROUNDWATER

FIGURE 8-7



LEGEND:

- Canonie Boring Location
- ⊕ Canonie Monitoring Well Location
- ✕ Fence
- Sanitary Sewer Line
- Storm Sewer Line
- ⋈ Railroad
- Manhole
- Catch Basin

NOTES:

Boring and monitoring well locations were obtained from a base map provided by Canonie Environmental, Inc. The individual locations were digitized onto a base map CAD file provided by NAS Alameda.

All data shown on figures is from the Canonie investigation and reflects detections only.

At present, data has not been independently validated, and laboratory qualifiers are not shown.

**NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
SITE 4 - BUILDING 360,
AIRCRAFT ENGINE FACILITY
GENERAL CHEMICAL CHARACTERISTICS
OF GROUNDWATER**

FIGURE 8-8

9.0 SITE 7C - BUILDING 547, SERVICE STATION

9.1 SITE DESCRIPTION AND BACKGROUND

Site 7C consists of Building 547, a former on-base annex service station located between Eleventh and Main streets, approximately 900 feet south of the East Gate (Figure 1-2). The 2-acre site, shown on Figure 9-1, contains three 12,000-gallon underground fiberglass fuel tanks, one 10,000-gallon stainless steel waste oil tank and one 5,000-gallon underground stainless steel waste oil tank. A car wash facility also exists on the site. The five underground tanks are presumed to have been installed in 1971. The three 12,000-gallon fuel tanks are located in the northwest corner of the property. NAS Alameda plot plans for the site do not show the locations of the waste oil tanks.

In 1980, one of the 12,000-gallon fiberglass tanks was ruptured when a tank measuring rod was dropped into the bottom of the tank. The ruptured tank was reportedly drained and repaired between 1980 and 1987 (Canonie, 1990c). When 1987 tank testing survey by Environmental Resources Management revealed that feed lines to the same tank were leaking; they were subsequently removed and replaced. Following a failed precision tightness test during the 1988 tank testing survey, fuel from the ruptured tank was removed.

9.2 CURRENT SITE USE

Currently, Site 7C is not in operation. According to NAS Alameda personnel, the underground tanks are scheduled to be removed in 1993.

9.3 PREVIOUS INVESTIGATIONS

As described above, a tank testing survey was conducted in 1987 by Environmental Resources Management. Another tank testing survey was conducted in 1988. Other than the tank testing surveys, no subsurface investigations have been conducted at Site 7C.

9.4 REMEDIAL INVESTIGATION

The investigation performed by Canonie included a soil gas survey, borehole drilling, monitoring well construction, and groundwater sampling. Ten soil borings were drilled in the locations shown on Figure 9-1. Groundwater monitoring wells were constructed in five of the borings. Table 9-1 provides a complete list of analyses performed on soil and groundwater collected at Site 7C. The soil gas survey was performed using a

grid with approximately 50-foot spacing (Figure 9-1). A total of 62 samples were collected in an attempt to delineate the extent of hydrocarbons detected in soil vapors. Borehole logs and well construction details are presented in Appendix C.

9.4.1 Site Geology/Hydrogeology

Figure 9-2 presents two lithologic cross sections in the vicinity of Site 7C. Artificial fill consisting of dark brown to brown sandy clay, clayey sand, silty fine sand, and fine sand underlies the site to depths between 7.0 and 12.5 feet. Merritt Sand deposits consisting predominantly of orange-brown silty fine sand directly underlie the artificial fill to 15 feet bgs. Geotechnical laboratory analyses were conducted on soil samples collected from Site 10B; the results are summarized in Table 9-2 and the laboratory data sheets are provided in Appendix D. Hydraulic conductivity tests were conducted on the 10.5-foot sample from MW547-2 and the 2.0-foot sample from B547-9; results were 3.00×10^{-7} centimeters per second (cm/s) and 1.00×10^{-3} cm/s, respectively.

Groundwater was encountered during drilling at an average depth of 5 feet bgs. Depth to groundwater in the five monitoring wells as measured by Canonie on November 8, 1990 ranged between 5.54 and 7.04 feet bgs. Groundwater contours for November 8, 1990 are presented on Figure 2-4. The local hydraulic gradient at that time was about 0.008 foot/foot to the southeast. Groundwater samples collected from the five monitoring wells (MW547-1 through MW547-5) had specific conductivity values ranging from 810 to 1260 μ mhos. TDS was not measured in the groundwater samples from Site 7C.

9.4.2 Soil Gas Survey Results

The soil gas survey performed at Site 7C targeted the aromatic compounds benzene, toluene, ethylbenzene, and xylenes (BTEX), and THC. Table 9-3 shows the BTEX and THC values recorded in the survey. Copies of the condensed data provided by the soil gas subcontractor are provided in Appendix B.

Figure 9-3 illustrates the distribution of benzene identified in the soil gas survey. The highest concentrations of fuel constituents detected in the survey were at points located west of the central portion of the existing fuel islands and just south of the fuel tanks. Results of the soil gas survey suggested that fuel products may have impacted the subsurface soil. In addition, vapor phase hydrocarbons are present in the northwest portion of the site and along the western edge of Main Street, outside the fence marking the eastern boundary of NAS Alameda.

9.4.3 Analytical Results - Soil Samples

Soil samples for Site 7C were collected from five soil borings and during the drilling of five monitoring wells. At each boring, samples were collected at 1.0- to 1.5-foot intervals for a total of 127 soil samples. Surface and subsurface soil samples were selectively analyzed for VOCs, SVOCs, TRPH, pesticides and PCBs, EDB, metals, and general chemical characteristics. Additionally, subsurface samples were analyzed for VOCs and EDB. Table 9-1 provides a summary of analyses by sample. The analytical results are summarized in Tables 9-4 through 9-9 and shown on Figures 9-4 through 9-9. The figures and tables show only compounds that were detected.

9.4.3.1 Volatile Organic Compounds. Analytical results for VOCs detected in Site 7C soils are summarized in Table 9-4 and Figures 9-4 and 9-5. Several VOCs were detected in 49 out of 51 soil samples from various depths. Detected VOCs include methylene chloride, acetone, 1,2-dichloroethane (1,2-DCA), 2-butanone, TCE, benzene, 4-methyl-2-pentanone, toluene, ethylbenzene, and xylenes. The highest concentrations were detected in borings B547-7, B547-8, and well boring MW547-3 between 2 and 5 feet bgs. Toluene, detected in 46 samples, was the most prevalent VOC (Figure 9-5). Methylene chloride was also prevalent, with detections in all of the 49 samples except those with higher detection limits (Figure 9-4). Methylene chloride and acetone, which were also detected in most samples, are commonly seen as laboratory contaminants. Eight soil samples contained total VOC concentrations above 1 mg/kg. Six of the eight soil samples were collected from the unsaturated zone. BTEX are the primary VOCs found in all eight of the soil samples.

9.4.3.2 Semivolatile Organic Compounds. The analytical results for SVOCs in soils at Site 7C are summarized in Table 9-5 and shown on Figures 9-6 and 9-7. SVOCs were detected in 50 of 63 soil samples at Site 7C. SVOCs detected at Site 7C include the PAH compounds naphthalene, 2-methylnaphthalene, acenaphthene, fluorene, phenanthrene, anthracene, fluoranthene, pyrene, benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, indeno(1,2,3-cd)pyrene, and benzo(g,h,i)perylene; these compounds were found in 8 of the 50 samples. Phenol, di-n-butylphthalate, and bis(2-ethylhexyl)-phthalate, reported in 48 samples, comprise the remaining SVOCs detected. Concentrations of total SVOCs exceeded the 10 mg/kg preliminary comparison level for total SVOCs in one sample each from B547-7 and MW547-3.

9.4.3.3 Total Recoverable Petroleum Hydrocarbons. Analytical results for petroleum hydrocarbon compounds detected in Site 7C soils are summarized in Table 9-6 and shown on Figure 9-8. Site 7C soils were analyzed for TRPH only; TRPH was detected in 21 of 64 soil samples. The highest concentration was detected

in the 5.0- to 5.5-foot sample from B547-7, which is located closest to Building 547. A total of seven samples from five borings (B547-6, B547-7, B547-8, MW547-1, and MW547-3) had TRPH concentrations above the preliminary comparison level of 100 mg/kg.

9.4.3.4 Pesticides/PCBs. Analytical results for pesticides and PCB compounds are summarized in Table 9-7 and shown on Figure 9-9. Pesticides were detected in seven of the 63 soil samples analyzed. The pesticides that were detected in B547-3, B547-8, B547-10, and MW547-5 include 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, and methoxychlor. Alpha-chlordane and gamma-chlordane were detected in the 0.5- to 1-foot sample and the 2.5- to 3.0-foot sample from MW547-5 (only 33 samples were analyzed for alpha- and gamma-chlordane). No PCBs were detected in the soil samples at Site 7C.

9.4.3.5 Ethylene Dibromide. EDB is a chlorinated hydrocarbon of known toxicity that has been used in gasoline as an anti-knock agent. Soil samples at Site 7C were analyzed for EDB and the analytical results are summarized in Table 9-4 and shown on Figure 9-4. EDB was detected in 2 of 25 soil samples. Both occurrences of EDB were detected in boring B547-8.

9.4.3.6 Metals. Analytical results for metals in Site 7C soils are summarized in Table 9-8. At Site 7C, 63 soil samples were analyzed for their metal content. Background ranges of metals in soil have been estimated for NAS Alameda based on a study conducted by the PRC team under CTO 121 Mod. 0001. Results of this study are included in the background data summary report (PRC/JMM, 1992c). The estimated background ranges of metals in soil are given in Table 3-1. Based on these background data, 17 metals were detected above the 95 percent/95 percent statistical tolerance interval of background concentrations at NAS Alameda in at least one sample each. However, as noted below, all but magnesium are within normal or extreme concentrations found in typical soils.

Typical concentration ranges of metals occurring naturally in soil are given in Table 3-2. In at least one sample each, lead, magnesium, and zinc exceeded the typical ranges naturally found in soil. Lead concentrations detected in the surface sample from MW547-5 exceeded the extreme upper limit typical for soils. Concentrations of magnesium detected in the 10.0- to 10.5-foot sample from MW547-2 and the surface sample from MW547-1 exceed typical levels. No extreme upper limit is given for magnesium. The concentration of zinc detected in the 11.5- to 12.0-foot sample from boring B547-7 exceeded the typical range but was well within the extreme upper limit found in soils.

9.4.3.7 General Chemical Characteristics. Analytical results for general chemical parameters are summarized in Table 9-9. The results for TOC are shown on Figure 9-8. Eleven subsurface samples were

analyzed for soil pH and TOC and for the following parameters: percent ash, chloride, exchangeable ammonium, nitrate (as N), sulfate, TKN, and total phosphorous.

9.4.4 Analytical Results - Groundwater Samples

Groundwater samples were collected from five monitoring wells installed at Site 7C. Groundwater samples from the five monitoring wells were selectively analyzed for VOCs, SVOCs, EDB, TRPH, metals, and general chemical characteristics. Additionally, three travel blank samples were analyzed for VOCs and a replicate sample (MW547-5A) was analyzed for EDB, metals, pH, and specific conductivity. Table 9-1 provides a summary of analyses by sample. Tables 9-10 through 9-13 and Figures 9-10 through 9-12 summarize the analytical results for groundwater at Site 7C. The travel blank samples are identified on Table 9-10 by a 200-series number. The figures and tables show only compounds that were detected.

9.4.4.1 Volatile Organic Compounds. Analytical results for VOCs in groundwater are summarized in Table 9-10 and shown on Figure 9-10. VOC analyses were performed on all samples except the replicate. Methylene chloride, benzene, ethylbenzene, and xylenes were detected in groundwater samples collected from Site 7C. Methylene chloride was also detected in two travel blank samples. Benzene and ethylbenzene were detected in MW547-5 and xylenes were detected in MW547-3.

9.4.4.2 Semivolatile Organic Compounds. The analytical results for SVOCs in groundwater at Site 7C are summarized in Table 9-11 and Figure 9-10. SVOCs were detected in MW547-3 and MW547-4, two of five groundwater samples at Site 7C. SVOCs detected at the site include phenol and 2,4-dimethylphenol and the PAH compounds naphthalene and 2-methylnaphthalene.

9.4.4.3 Total Recoverable Petroleum Hydrocarbons. Analytical results for petroleum hydrocarbon compounds detected in groundwater at Site 7C are summarized in Table 9-11 and shown on Figure 9-10. Groundwater at Site 7C was analyzed for TRPH only. TRPH was detected in MW547-3 and MW547-4, two of a total of five groundwater samples.

9.4.4.4 Metals. Analytical results for metals in groundwater are summarized in Table 9-12 and shown on Figure 9-11. Five groundwater samples from Site 7C were analyzed for metals: MW547-1 through MW547-3, MW547-5, and MW547-5A. According to the Canonie QAPP and QA/QC plan, groundwater samples for metals were field-filtered as appropriate with a 0.45-micron filter (Canonie, 1990b). Background ranges of metals in groundwater have been estimated for NAS Alameda based on a study conducted by the PRC team as part of CTO 121 Mod. 0001. Results of this study are included in the background data summary report

(PRC/JMM, 1992c). The estimated background ranges of metals in groundwater are given in Table 3-3 and discussed in Section 3. Based on these background data, barium, manganese, and potassium, which had concentrations exceeding the typical limits, were within background levels (95 percent/95 percent statistical tolerance intervals) estimated for NAS Alameda.

Typical concentration ranges of metals occurring naturally in groundwater are given in Table 3-4. Based on these ranges, groundwater samples from at least one of the five wells exceeded the typical ranges for aluminum, arsenic, barium, chromium, cobalt, copper, iron, manganese, nickel, potassium, selenium, silver, titanium, and vanadium. For those elements with extreme limits provided, vanadium was exceeded in all five wells, and arsenic, iron, manganese, and potassium were well within their extreme limits. For arsenic, selenium, and silver, the detection limit was higher for some samples than the typical limit of those metals occurring naturally in groundwater.

9.4.4.5 General Chemical Characteristics. General chemical analyses performed on the groundwater samples from the five monitoring wells include specific conductivity, dissolved oxygen (four samples only), pH, TOC, and total hardness (as CaCO₃). Results of the general chemical analyses are presented in Table 9-13 and shown on Figure 9-12.

9.5 SUMMARY AND CONCLUSIONS

The purpose of the Data Summary Report is to provide a qualitative assessment of the Canonic data to identify whether sufficient information has been collected for the RI/FS evaluation. As discussed in Section 3, QA/QC information is not available for the data validation; therefore, the data presented in this report have not been validated under EPA CLP procedures.

9.5.1 Soil Gas Survey

The investigation conducted by Canonic at Site 7C included a soil gas survey which targeted the aromatic hydrocarbon compounds BTEX and THC. The soil gas survey was performed over a grid with approximately 50-foot spacing. A total of 62 samples were collected at depths of 2 to 6 feet bgs.

Elevated concentrations of BTEX and THC were reported. Benzene gas was detected over the site and to the north and south with a maximum concentration of 120,000 µg/L centered south of Building 547, west of the central portion of the existing fuel islands and east of the suspected underground storage tank (UST)

location. The distribution suggests that feed lines between the fuel USTs and the underground waste oil tank may have served as a source for BTEX to migrate to the soil.

9.5.2 Soils

A total of 127 surface and subsurface samples were collected by Canonie from five soil borings and during the drilling of five monitoring wells at Site 7C. Boring logs indicate that artificial fill underlies the site and Merritt Sand deposits directly underlie the fill. Site 7C soils were analyzed for VOCs, SVOCs, EDB, TRPH, pesticide and PCB compounds, and metals, all of which were detected except PCB compounds.

VOCs including BTEX were detected in soil samples collected from both the fill and the Merritt Sand. Low levels of methylene chloride and acetone, two common laboratory contaminants, were detected at most locations. BTEX were also detected at most locations and concentrations generally decreased with depth. The highest concentrations (> 1 mg/kg total) were detected in B547-7, B547-8, and MW547-3. B547-7 and B547-8 are located on the north side of the former service station; MW547-3 is the closest boring to the south of the former service station. Samples from these wells exceeded the preliminary comparison level for total VOCs. Several borings are located near the perimeter of the site that had comparatively low BTEX concentrations. At most borings, comparatively low concentrations of VOCs were detected in the saturated zone.

SVOCs, including phthalates and PAH, were detected at low concentrations in at least one sample from every boring. MW547-1, B547-9, MW547-4, and B547-10, which are located along the western and southern fence, had the least number of analytes detected. Bis(2-Ethylhexyl)phthalate was the predominant SVOC, with concentrations generally increasing with depth. The remaining borings had several SVOCs detected. B547-7 and MW547-3 had total concentrations in samples from the artificial fill that exceeded the preliminary comparison level for total SVOCs.

EDB was detected in only two samples from 25 samples analyzed for EDB; the 3.5- and 5.0-foot samples from B547-8.

TRPH was detected at nine of the ten boring locations. All detections occurred within the artificial fill. The northernmost borings, MW547-1 and MW547-2, did not appear to have any deep samples analyzed. Only one detection was reported within the saturated zone; the deepest detection was at 8.5 feet bgs in MW547-5, which is located in the southwest corner of the site. TRPH concentrations are elevated, compared to the other detections, in B547-7, which is the closest boring to the former service station. No other pattern is apparent in the TRPH detections.

Low levels of pesticides ($< 100 \mu\text{g/kg}$) were detected within the artificial fill in four of the ten borings at Site 7C. The concentrations of pesticides reported are close to the detection limits. The borings in which the pesticides were detected are located in the central portion of the site and along the southern border.

Sixteen metals are present in the soil samples at concentrations exceeding the 95 percent/95 percent statistical tolerance interval of background concentrations at NAS Alameda (PRC/JMM, 1992c). With the exception of lead and magnesium, however, all metals analyzed were within the range of concentrations typically found in soils.

If the analytical results can be validated and are considered to be acceptable, the following conclusions can be made:

- The soil at the site has been impacted by VOCs (primarily BTEX). Sufficient VOC data for soil have been collected for the RI/FS evaluation.
- Because the TRPH analysis included both the light and heavy fractions of petroleum hydrocarbons, additional soil sampling is required to separately characterize the light and heavy fractions of petroleum hydrocarbons.
- Sufficient metals data for soil have been collected for the RI/FS evaluation.

The significance of the presence of these VOCs, SVOCs, pesticides, TRPH, and metals will be further evaluated during the risk assessment to be performed during the comprehensive RI/FS evaluation.

9.5.3 Groundwater

Five monitoring wells were installed by Canonie at Site 7C. Based on water level measurements taken in November 1990, groundwater flow is to the south and southeast at a gradient of about 0.008 foot/foot to the southeast. Groundwater samples were taken from each well and analyzed for VOCs, SVOCs, TRPH, metals, pesticides and PCBs, EDB, and general chemical characteristics. No pesticides, PCBs, or EDB were detected in the groundwater samples at Site 7C.

VOCs and SVOCs were detected in groundwater samples at Site 7C. VOCs were detected at elevated concentrations in four wells, one of which contained only methylene chloride; methylene chloride was also detected in the travel blank samples. The three remaining wells are located in the southern portion of the site. SVOCs were detected in two wells that are also in the southern portion of the site. TRPH was detected in two of the southern wells.

Twelve metals are present in the groundwater at concentrations exceeding the 95 percent/95 percent statistical tolerance interval of background concentrations at NAS Alameda (PRC/JMM, 1992c). However, five of these metals have an extreme upper concentration that can be found in typical groundwater samples; with the exception of vanadium, the concentrations at Site 7C are within those extreme upper limits (Table 3-4). The concentrations of zinc in the groundwater samples exceed the background limit but do not exceed the typical concentration limit. The five monitoring wells are similar in the number of metals with elevated concentrations.

If the analytical results can be validated and are considered to be acceptable, the following conclusions can be made:

- Because only one sampling quarter of groundwater data is available, additional groundwater data will be required to characterize the groundwater quality and its seasonal variation at this site.
- Metals are present in the groundwater at concentrations exceeding the 95 percent/95 percent statistical tolerance interval.
- Currently, no downgradient well is present south of monitoring wells MW547-3, MW547-4, and MW547-5 to further define the extent of VOCs in groundwater at the site.
- TDS data are required to evaluate whether groundwater beneath the site is considered as potential drinking water.
- At present, no information is available to evaluate the tidal influence on groundwater and the deeper groundwater-bearing zone. Additional work is required to evaluate the tidal influence and the deeper groundwater-bearing zone.

The significance of the presence of these VOCs, SVOCs, TRPH, and metals in groundwater will be further evaluated during the risk assessment to be performed during the comprehensive RI/FS work.

TABLE 9-1

SITE 7C - BUILDING 547, SERVICE STATION
SUMMARY OF LABORATORY ANALYSES PERFORMED ON SOIL AND GROUNDWATER SAMPLES
(Sheet 1 of 6)

Boring	Depth	Matrix	Alkalinity/Acidity	Ammonia	Ammonium	Asbestos (Tot)	Ash (Tot)	SVOC	BTU Value	Cations/Anions	CEC	Cyanide (Tot)	DO (Tot)	EDB	Herb Uniq	Herbicides	Mercury	Metals	Pes/PCB	pH	Phosphorous	Potassium	Radiation	Spec. Con.	Kjeldahl Nitrogen	TOC	TPH as Diesel	TRPH	TS/TDS	VOC
B547-10	0.5-1.0	Soil				.											.	.												
B547-10	1.0-1.5	Soil		.		.	.												.				.	.		.
B547-10	2.0-2.5	Soil				.						.															.			.
B547-10	2.5-3.0	Soil				.						.					.	.	.							.				.
B547-10	5.0-5.5	Soil				.						.					.	.								.				.
B547-10	5.5-6.0	Soil				.						.					.	.								.				.
B547-10	8.0-8.5	Soil				.						.					.	.								.				.
B547-10	8.5-9.0	Soil				.						.					.	.								.				.
B547-10	11.0-11.5	Soil				.						.					.	.								.				.
B547-10	11.5-12.0	Soil				.						.					.	.								.				.
B547-10	14.0-14.5	Soil				.						.					.	.								.				.
B547-10	14.5-15.0	Soil				.						.					.	.								.				.
B547-6	2.0-2.5	Soil				.						.					.	.								.				.
B547-6	2.5-3.0	Soil		.		.	.					.					.	.	.	.			.	.		.				.
B547-6	3.5-4.0	Soil		.		.	.					.					.	.	.	.			.	.		.				.
B547-6	4.5-5.0	Soil				.						.					.	.								.				.
B547-6	5.0-5.5	Soil				.						.					.	.								.				.
B547-6	6.0-6.5	Soil				.						.					.	.								.				.
B547-6	6.5-7.0	Soil				.						.					.	.								.				.
B547-6	9.0-9.5	Soil				.						.					.	.								.				.
B547-6	9.5-10.0	Soil				.						.					.	.								.				.
B547-6	11.0-11.5	Soil				.						.					.	.								.				.
B547-6	11.5-12.0	Soil				.						.					.	.								.				.
B547-6	14.0-14.5	Soil				.						.					.	.								.				.
B547-6	14.5-15.0	Soil				.						.					.	.								.				.
B547-7	0.5-1.0	Soil				.						.					.	.		.				.	.		.			.
B547-7	1.0-1.5	Soil		.		.	.					.					.	.		.			.	.		.				.

TABLE 9-1

SITE 7C - BUILDING 547, SERVICE STATION
SUMMARY OF LABORATORY ANALYSES PERFORMED ON SOIL AND GROUNDWATER SAMPLES
 (Sheet 2 of 6)

Boring	Depth	Matrix	Alkalinity/Acidity	Ammonia	Ammonium	Asbestos (Tot)	Ash (Tot)	SVOC	BTU Value	Cations/Anions	CEC	Cyanide (Tot)	DO (Tot)	EDB	Herb Uniq	Herbicides	Mercury	Metals	Pest/PCB	pH	Phosphorous	Potassium	Radiation	Spec. Con.	Kjeldahl Nitrogen	TOC	TPH as Diesel	TRPH	TS/TDS	VOC
B547-7	2.0-2.5	Soil				.											.	.	.											.
B547-7	2.5-3.0	Soil															.	.	.							.				.
B547-7	5.0-5.5	Soil				.											.	.	.											.
B547-7	5.5-6.0	Soil															.	.	.							.				.
B547-7	8.0-8.5	Soil				.											.	.	.							.				.
B547-7	8.5-9.0	Soil															.	.	.							.				.
B547-7	9.0-9.5	Soil															.	.	.							.				.
B547-7	11.0-11.5	Soil				.											.	.	.							.				.
B547-7	11.5-12.0	Soil															.	.	.							.				.
B547-7	14.0-14.5	Soil				.											.	.	.							.				.
B547-7	14.5-15.0	Soil				.											.	.	.							.				.
B547-8	1.0-1.5	Soil				.											.	.	.							.				.
B547-8	2.0-2.5	Soil	.		.	.	.										.	.	.	.			.	.		.				.
B547-8	3.5-4.0	Soil				.						.					.	.	.							.				.
B547-8	4.0-4.5	Soil				.						.					.	.	.	.						.				.
B547-8	5.0-5.5	Soil				.						.					.	.	.							.				.
B547-8	5.5-6.0	Soil				.						.					.	.	.							.				.
B547-8	8.0-8.5	Soil				.						.					.	.	.							.				.
B547-8	8.5-9.0	Soil				.						.					.	.	.							.				.
B547-8	11.0-11.5	Soil				.						.					.	.	.							.				.
B547-8	11.5-12.0	Soil				.						.					.	.	.							.				.
B547-8	12.5-13.0	Soil				.						.					.	.	.							.				.
B547-8	13.0-13.5	Soil				.						.					.	.	.							.				.
B547-9	1.0-1.5	Soil				.						.					.	.	.							.				.
B547-9	2.5-3.0	Soil	.		.	.	.					.					.	.	.	.			.	.		.				.
B547-9	3.5-4.0	Soil				.						.					.	.	.					.	.	.				.
B547-9	4.0-4.5	Soil				.						.					.	.	.	.					.	.	.			.

SITE 7C - BUILDING 547, SERVICE STATION
SUMMARY OF LABORATORY ANALYSES PERFORMED ON SOIL AND GROUNDWATER SAMPLES
(Sheet 3 of 6)

Boring	Depth	Matrix	Alkalinity/Acidity	Ammonia	Ammonium	Asbestos (Tot)	Ash (Tot)	SVOC	BTU Value	Cations/Anions	CEC	Cyanide (Tot)	DO (Tot)	EDB	Herb Uniq	Herbicides	Mercury	Metals	Pest/PCB	pH	Phosphorous	Potassium	Radiation	Spec. Con.	Kjeldahl Nitrogen	TOC	TPH as Diesel	TRPH	TS/TDS	VOC
B547-9	5.0-5.5	Soil				.						.																	.	
B547-9	5.5-6.0	Soil															.	.									.			
B547-9	8.0-8.5	Soil				.						.					.	.									.		.
B547-9	8.5-9.0	Soil				.						.					.	.									.		.
B547-9	11.0-11.5	Soil				.						.					.	.									.		.
B547-9	11.5-12.0	Soil				.						.					.	.									.		.
B547-9	14.0-14.5	Soil				.						.					.	.									.		.
B547-9	14.5-15.0	Soil				.						.					.	.									.		.
MW547-1	0.5-1.0	Soil				.						.					.	.									.		.
MW547-1	1.0-1.5	Soil		.	.	.						.					.	.		.				.	.				.
MW547-1	2.0-2.5	Soil				.						.					.	.									.		.
MW547-1	2.5-3.0	Soil				.						.					.	.	.								.		.
MW547-1	4.5-5.0	Soil				.						.					.	.									.		.
MW547-1	5.0-5.5	Soil				.						.					.	.									.		.
MW547-1	8.0-8.5	Soil				.						.					.	.									.		.
MW547-1	8.5-9.0	Soil				.						.					.	.									.		.
MW547-1	11.0-11.5	Soil				.						.					.	.									.		.
MW547-1	11.5-12.0	Soil				.						.					.	.									.		.
MW547-1	14.0-14.5	Soil				.						.					.	.									.		.
MW547-1	14.5-15.0	Soil				.						.					.	.									.		.
MW547-2	0.5-1.0	Soil				.						.					.	.									.		.
MW547-2	1.5-2.0	Soil		.	.	.						.					.	.		.			.	.					.
MW547-2	2.0-2.5	Soil				.						.					.	.									.		.
MW547-2	2.5-3.0	Soil				.						.					.	.	.								.		.
MW547-2	5.0-5.5	Soil				.						.					.	.									.		.
MW547-2	5.5-6.0	Soil				.						.					.	.									.		.
MW547-2	6.0-6.5	Soil				.						.					.	.									.		.

SITE 7C - BUILDING 547, SERVICE STATION
SUMMARY OF LABORATORY ANALYSES PERFORMED ON SOIL AND GROUNDWATER SAMPLES
(Sheet 4 of 6)

[illegible]

SITE 7C - BUILDING 547, SERVICE STATION
SUMMARY OF LABORATORY ANALYSES PERFORMED ON SOIL AND GROUNDWATER SAMPLES
(Sheet 5 of 6)

Boring	Depth	Matrix	Alkalinity/Acidity	Ammonia	Ammonium	Asbestos (Tot)	Ash (Tot)	SVOC	BTU Value	Cations/Anions	CEC	Cyanide (Tot)	DO (Tot)	EDB	Herb Uniq	Herbicides	Mercury	Metals	Pes/PCB	pH	Phosphorous	Potassium	Radiation	Spec. Con.	Kjeldahl Nitrogen	TOC	TPH as Diesel	TRPH	TS/TDS	VOC
MW547-4	8.5-9.0	Soil					•										•	•									•			
MW547-4	10.5-11.0	Soil																												•
MW547-4	11.0-11.5	Soil					•										•	•									•			
MW547-4	14.0-14.5	Soil																									•			•
MW547-4	14.5-15.0	Soil					•										•	•									•			
MW547-5	0.5-1.0	Soil					•										•	•												
MW547-5	1.0-1.5	Soil		•		•		•													•				•	•				
MW547-5	2.0-2.5	Soil					•																							•
MW547-5	2.5-3.0	Soil															•	•		•							•			
MW547-5	5.0-5.5	Soil					•										•	•									•			•
MW547-5	5.5-6.0	Soil															•	•									•			
MW547-5	8.0-8.5	Soil					•										•	•									•			•
MW547-5	8.5-9.0	Soil															•	•									•			
MW547-5	10.5-11.0	Soil					•																					•		•
MW547-5	11.0-11.5	Soil					•																					•		•
MW547-5	11.5-12.0	Soil															•	•									•			
MW547-5	12.0-12.5	Soil															•	•									•			
MW547-5	14.0-14.5	Soil					•										•	•									•			•
MW547-5	14.5-15.0	Soil															•	•									•			
Summary Soil			11		11	63	11					25				63	63	11	11					11	11		64		51	
201	0.0	Water																												•
202	0.0	Water																												•
203	0.0	Water																												•
MW547-1	0.0	Water					•					•	•			•	•	•				•			•		•			•
MW547-2	0.0	Water					•					•	•			•	•	•				•			•		•			•
MW547-3	0.0	Water					•					•	•			•	•	•				•			•		•			•
MW547-4	0.0	Water					•					•					•								•		•			•

TABLE 9-1

SITE 7C - BUILDING 547, SERVICE STATION
SUMMARY OF LABORATORY ANALYSES PERFORMED ON SOIL AND GROUNDWATER SAMPLES
 (Sheet 6 of 6)

Boring	Depth	Matrix	Alkalinity/Acidity	Ammonia	Ammonium	Asbestos (Tot)	Ash (Tot)	SVOC	BTU Value	Cations/Anions	CEC	Cyanide (Tot)	DO (Tot)	EDB	Herb Uniq	Herbicides	Mercury	Metals	Pest/PCB	pH	Phosphorous	Potassium	Radiation	Spec. Con.	Kjeldahl Nitrogen	TOC	TPH as Diesel	TRPH	TS/TDS	VOC
MW547-5	0.0	Water																												
MW547-5A	0.0	Water																												
Summary Water								5				4	5				5	5	5				5		5		5			8

Notes:

200 series boring numbers indicate travel blanks

Analysis	Methods	Matrix	Analysis	Methods	Matrix
Misc			Metals	EPA 200.7	soil
Phosphorus	ASA #9 24-2.3	soil	Metals	EPA 6010	soil
TKN	ASA #9 31-3	soil	Metals	EPA 200.7	water
Nitrate	EPA 300.0	soil	TRPH	EPA 418.1	soil
Chloride	EPA 300.0(mod)	soil	EDB	EPA 504	water
Ammonium	EPA/CE81-1	soil	VOC	EPA 504	soil
Hardness	SM 314A	water	VOC	EPA 624	water
BTU	ASTM D3286-73	soil	VOC	EPA 8240	soil
DO	DO	water	Pest/PCB	EPA 608	water
Spec cond	EPA 120.1	water	SVOC	EPA 8270	soil
pH	EPA 150.1	water	TOC	EPA/CE 81-1	soil
pH	EPA 9045	soil	ASH	EPA SM302H	soil

TABLE 9-2

**SITE 7C - BUILDING 547, SERVICE STATION
GEOTECHNICAL SAMPLE LABORATORY TEST RESULTS**

Sample No.	Depth (ft)	Soil Classification		Moisture Content (%)	Dry Density (pcf)	Specific Gravity	Hydraulic Conductivity (cm/s)
		Laboratory	Field				
MW547-1	3.5	SM	SP/SM	NA	NA	NA	NA
MW547-2	4	SP/SM	SM	19.4	109.9	NA	NA
MW547-2	10.5	SM	SC	20.1	109.5	NA	3.00E-07
MW547-3	0.5	SP/SM	SP	3.3	109.9	NA	NA
MW547-4	4	SM	SM	21.8	102.1	NA	NA
MW547-5	6	SM	SM	15.2	110.1	NA	NA
B547-6	8	SM	SC	21.6	104.4	NA	NA
B547-7	4	SP/SM	SP	7.8	94.2	NA	NA
B547-8	2.5	SP/SM	SP	NA	NA	NA	NA
B547-9	2	SM	SM	12.9	100.6	NA	1.00E-03

Notes:

NA - Not Analyzed

Parameters not detected are reported as less than method detection limit.

Laboratory Methods (Units):

Soil Classification - Unified Soil Classification System (USCS) - ASTM D2488

Moisture Content - ASTM D2216 (percent)

Dry Density - ASTM D2937 (pounds per cubic foot)

Specific Gravity - ASTM D854

Hydraulic Conductivity - EPA 9100 (centimeters per second)

Soil Classification Legend:

GW	Well graded gravels, gravel-sand mixtures, little or no fines	SM	Silty sands, sand-silt mixtures
GP	Poorly graded gravels, gravel-sand mixtures, little or no fines	SC	Clayey sands, sand-clay mixtures
GM	Silty gravels, gravel-sand-silt mixtures	ML	Inorganic silts and very fine sands, rock flow silty or clayey fine sands or clayey silts with slight plasticity
GC	Clayey gravels, gravel-sand-clay mixtures	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
SW	Well graded sands, gravelly sands, little or no fines	OL	Organic silts and organic silty clays or low plasticity
SP	Poorly-graded sands, gravelly sands, little or no fines	CH	Inorganic clays of high plasticity, fat clays

TABLE 9-3
SITE 7C-BUILDING 547-SERVICE STATION
SOIL GAS SURVEY RESULTS
(Sheet 1 of 3)

Sample Location- Probe Depth (feet)	Concentration (µg/L)				
	Benzene	Toluene	Ethyl Benzene	Xylene	Total Hydrocarbons
L0-6	0.2	0.2	<0.06	<0.07	6
L1-4	<0.1	0.4	<0.1	<0.2	0.8
L2-4	<0.04	<0.05	<0.06	<0.07	<0.05
L3-4	0.08	0.2	<0.06	<0.07	0.7
L4-4	<0.04	<0.05	<0.06	<0.07	0.2
L5-4	0.04	0.05	<0.06	<0.07	0.2
L6-3	<0.04	<0.05	<0.06	<0.07	<0.05
L7-3	<0.04	<0.05	<0.06	<0.07	0.2
L8-4	<0.04	<0.05	<0.06	<0.07	<0.05
M0-5	0.08	0.2	<0.06	<0.07	60
M1-4	0.7	4	<0.06	<0.06	10
M2-5	14	20	<0.07	<0.08	38
M3-5	9	10	<0.09	<0.1	71
M4-5	0.4	0.2	<0.06	<0.07	4
M6-5	<0.04	0.1	<0.06	<0.07	1
M7-3	<0.04	<0.04	<0.06	<0.07	40
M8-3	<0.04	<0.05	<0.06	<0.07	<0.05
N0-4	<0.04	<0.04	<0.06	<0.07	1,100
N1-4	190	500	35	7	2,900
N2-5	53,000	46,000	7,400	2,205	1,200,000
N3-5	46,000	22,000	4,100	980	840,000
N4-4	27,000	15,000	<55	<66	490,000
N5-4	0.06	<0.04	<0.06	<0.07	3
N6-4	<0.04	0.06	<0.06	<0.07	2
N7-5	<0.04	0.2	<0.06	<0.07	10
N8-3	0.3	0.3	<0.08	<0.08	2

TABLE 9-3
SITE 7C-BUILDING 547-SERVICE STATION
SOIL GAS SURVEY RESULTS
(Sheet 2 of 3)

Sample Location- Probe Depth (feet)	Concentration (µg/L)				
	Benzene	Toluene	Ethyl Benzene	Xylene	Total Hydrocarbons
00-3	<0.04	<0.04	<0.06	<0.07	3
01-3	0.09	0.7	<0.1	<0.1	0.9
02-5	57,000	26,000	5,200	1,400	920,000
03-4	7	2	<0.06	<0.07	120
04-3	9,500	4,200	<55	<66	200,000
05-5	0.5	0.8	<0.06	<0.07	10
06-5	0.2	0.2	<0.05	<0.07	2
07-5	0.6	0.4	<0.05	<0.07	7
08-3	0.05	0.08	<0.06	<0.07	0.4
P0-2	<0.04	<0.04	<0.06	<0.07	6
P1-3	0.2	1	<0.07	<0.08	4
P2-5	120,000	27,000	13,000	3,700	970,000
P3-4	2,300	320	220	<0.07	36,000
P4-5	15,000	4,100	<55	190	260,000
P5-5	<0.04	<0.04	<0.06	<0.07	<0.05
P6-5	0.4	0.2	<0.05	<0.07	4
P7-4	<0.04	<0.04	<0.05	<0.07	3
P8-4	<0.04	<0.05	<0.06	<0.07	<0.05
Q0-5	<0.04	<0.04	<0.06	<0.07	1
Q1-4	3	0.7	0.6	<0.1	14
Q2-5	100,000	24,000	9,200	2,700	550,000
Q3-6	0.8	2	<0.06	<0.07	10
Q4-5	<0.04	<0.04	<0.06	<0.07	<0.05
Q5-5	<0.04	<0.04	<0.06	<0.07	<0.05
Q5.5-5	<0.04	<0.04	<0.06	<0.07	<0.05
Q6-5	<0.04	<0.04	<0.05	<0.07	19
Q7-5	0.08	0.4	<0.06	<0.07	5
Q8-4	0.3	0.3	0.08	<0.08	2

TABLE 9-3
SITE 7C-BUILDING 547-SERVICE STATION
SOIL GAS SURVEY RESULTS
(Sheet 3 of 3)

Sample Location- Probe Depth (feet)	Concentration (µg/L)				
	Benzene	Toluene	Ethyl Benzene	Xylene	Total Hydrocarbons
R0-4	<0.04	<0.04	<0.06	<0.07	2
R1-4	<0.05	0.4	<0.08	<0.08	0.4
R2-4	<0.1	0.4	<0.2	<0.2	0.4
R3-4	0.4	4	0.6	<0.2	6
R4-4	INT	2	0.3	<0.1	2
R5-4	0.6	48	0.4	4	90
R7-3	<0.06	<0.08	<0.1	<0.1	<0.08
R8-4	<0.05	<0.06	0.09	<0.08	0.2

Notes:

< X denotes the analyte was not detected to a level of X.

INT denotes no result reported due to interfering adjacent peaks.

TABLE 9-4

SITE 7C - BUILDING 547, SERVICE STATION
RESULTS FOR VOLATILE ORGANIC COMPOUNDS AND
ETHYLENE DIBROMIDE DETECTED IN SOIL SAMPLES
 (Sheet 1 of 7)

Parameter Reported	B547-10 07/02/90 2-2.5 ft	B547-10 07/02/90 5-5.5 ft	B547-10 07/02/90 8-8.5 ft	B547-10 07/02/90 11-11.5 ft	B547-10 07/02/90 14-14.5 ft	B547-6 07/02/90 4.5-5 ft	B547-6 07/02/90 6-6.5 ft
Methylene Chloride (ug/kg)	22	25	18	24	19	20	22
Acetone (ug/kg)	<11.0	52	13	<12.0	<12.0	21	27
1,2-Dichloroethane (ug/kg)	<5.40	<6.20	<6.10	<6.10	<5.90	<5.80	<6.10
2-Butanone (ug/kg)	<11.0	<12.0	<12.0	<12.0	<12.0	<12.0	<12.0
Trichloroethene (ug/kg)	<5.40	<6.20	<6.10	<6.10	<5.90	<5.80	<6.10
Benzene (ug/kg)	<5.40	<6.20	<6.10	<6.10	<5.90	<5.80	<6.10
4-Methyl-2-pentanone (ug/kg)	<5.40	<6.20	<6.10	<6.10	<5.90	<5.80	<6.10
Toluene (ug/kg)	38	52	<6.10	10	21	7	<6.10
Ethylbenzene (ug/kg)	<5.40	<6.20	<6.10	<6.10	<5.90	<5.80	<6.10
Xylenes (total) (ug/kg)	<5.40	<6.20	<6.10	<6.10	<5.90	17	<6.10
Parameter Reported	B547-8 07/03/90 3.5-4 ft	B547-8 07/03/90 5-5.5 ft					
Ethylene Dibromide (ug/kg)	1.8	2.4					

Notes: NA = Not Analyzed
 < = Detection Limit
 ug/kg = micrograms per kilogram
 Data not validated by JMM

TABLE 9-4

SITE 7C - BUILDING 547, SERVICE STATION
RESULTS FOR VOLATILE ORGANIC COMPOUNDS AND
ETHYLENE DIBROMIDE DETECTED IN SOIL SAMPLES
(Sheet 2 of 7)

Parameter Reported	B547-6 07/02/90 9-9.5 ft	B547-6 07/02/90 11-11.5 ft	B547-6 07/02/90 14-14.5 ft	B547-7 06/28/90 2-2.5 ft	B547-7 06/28/90 5-5.5 ft	B547-7 06/28/90 8-8.5 ft	B547-7 06/28/90 11-11.5 ft
Methylene Chloride (ug/kg)	21	8	17	<1300	<5500	6	<30.0
Acetone (ug/kg)	<12.0	<12.0	<12.0	<1300	<5500	18	<61
1,2-Dichloroethane (ug/kg)	<5.80	<6.00	<6.00	<670	<2700	<6.00	<30.0
2-Butanone (ug/kg)	<12.0	<12.0	<12.0	<1300	<5500	12	19
Trichloroethene (ug/kg)	<5.80	<6.00	<6.00	<670	<2700	<6.00	<30.0
Benzene (ug/kg)	<5.80	<6.00	<6.00	170	1400	13	730
4-Methyl-2-pentanone (ug/kg)	<5.80	<6.00	<6.00	<1300	<5500	<12.0	<61
Toluene (ug/kg)	18	18	6	1600	23000	18	390
Ethylbenzene (ug/kg)	<5.80	<6.00	<6.00	760	14000	3	130
Xylenes (total) (ug/kg)	<5.80	<6.00	8	4500	97000	23	480

Notes: NA = Not Analyzed
< = Detection Limit
ug/kg = micrograms per kilogram
Data not validated by JMM

TABLE 9-4

**SITE 7C - BUILDING 547, SERVICE STATION
RESULTS FOR VOLATILE ORGANIC COMPOUNDS AND
ETHYLENE DIBROMIDE DETECTED IN SOIL SAMPLES
(Sheet 3 of 7)**

Parameter Reported	B547-7 06/28/90 14-14.5 ft	B547-8 07/03/90 3.5-4 ft	B547-8 07/03/90 5-5.5 ft	B547-8 07/03/90 8-8.5 ft	B547-8 07/03/90 11-11.5 ft	B547-8 07/03/90 12.5-13 ft	B547-9 07/02/90 3.5-4 ft
Methylene Chloride (ug/kg)	7	920	<6600	84	23	14	19
Acetone (ug/kg)	34	<1300	<13000	690	<12.0	<12.0	<12.0
1,2-Dichloroethane (ug/kg)	<6.00	<660	<6600	<30.0	14	7	<5.90
2-Butanone (ug/kg)	12	<1300	<13000	<60	<12.0	<12.0	<12.0
Trichloroethene (ug/kg)	<6.00	<660	<6600	<30.0	11	<6.00	<5.90
Benzene (ug/kg)	100	<660	<6600	430	<6.00	<6.00	<5.90
4-Methyl-2-pentanone (ug/kg)	<12.0	<660	<6600	<30.0	<6.00	<6.00	<5.90
Toluene (ug/kg)	5	1500	39000	720	64	<6.00	26
Ethylbenzene (ug/kg)	32	1000	<6600	160	<6.00	<6.00	42
Xylenes (total) (ug/kg)	2	6800	33000	890	7	<6.00	240

Notes: NA = Not Analyzed

< = Detection Limit

ug/kg = micrograms per kilogram

Data not validated by JMM

TABLE 9-4

**SITE 7C - BUILDING 547, SERVICE STATION
RESULTS FOR VOLATILE ORGANIC COMPOUNDS AND
ETHYLENE DIBROMIDE DETECTED IN SOIL SAMPLES
(Sheet 4 of 7)**

Parameter Reported	B547-9 07/02/90 5-5.5 ft	B547-9 07/02/90 8-8.5 ft	B547-9 07/02/90 14-14.5 ft	MW547-1 06/29/90 2-2.5 ft	MW547-1 06/29/90 4.5-5 ft	MW547-1 06/29/90 8-8.5 ft	MW547-1 06/29/90 11-11.5 ft
Methylene Chloride (ug/kg)	26	24	30	7	10	9	9
Acetone (ug/kg)	18	<12.0	<12.0	6	51	18	17
1,2-Dichloroethane (ug/kg)	<6.10	<6.00	<6.20	<5.00	<6.00	<6.00	<6.00
2-Butanone (ug/kg)	<12.0	<12.0	<12.0	<10.0	6	<12.0	<12.0
Trichloroethene (ug/kg)	<6.10	<6.00	<6.20	<5.00	<6.00	<6.00	<6.00
Benzene (ug/kg)	<6.10	<6.00	<6.20	<5.00	<6.00	<6.00	<6.00
4-Methyl-2-pentanone (ug/kg)	<6.10	<6.00	<6.20	<10.0	<12.0	<12.0	<12.0
Toluene (ug/kg)	14	47	21	3	24	6	11
Ethylbenzene (ug/kg)	<6.10	<6.00	<6.20	<5.00	<6.00	<6.00	<6.00
Xylenes (total) (ug/kg)	<6.10	<6.00	<6.20	<5.00	<6.00	<6.00	<6.00

Notes: NA = Not Analyzed

< = Detection Limit

ug/kg = micrograms per kilogram

Data not validated by JMM

TABLE 9-4

SITE 7C - BUILDING 547, SERVICE STATION
RESULTS FOR VOLATILE ORGANIC COMPOUNDS AND
ETHYLENE DIBROMIDE DETECTED IN SOIL SAMPLES
 (Sheet 5 of 7)

Parameter Reported	MW547-1 06/29/90 14-14.5 ft	MW547-2 06/29/90 2-2.5 ft	MW547-2 06/29/90 5.5-6 ft	MW547-2 06/29/90 9.5-10 ft	MW547-2 06/29/90 12.5-13 ft	MW547-2 06/29/90 14-14.5 ft	MW547-3 07/02/90 3.5-4 ft
Methylene Chloride (ug/kg)	10	<13.0	9	9	8	4	54000
Acetone (ug/kg)	48	<26.0	20	11	<12.0	20	<14000
1,2-Dichloroethane (ug/kg)	<6.00	<13.0	<6.00	<6.00	<6.00	<6.00	<7200
2-Butanone (ug/kg)	<13.0	<26.0	<12.0	<12.0	<12.0	<12.0	<14000
Trichloroethene (ug/kg)	<6.00	4	<6.00	<6.00	<6.00	<6.00	<7200
Benzene (ug/kg)	<6.00	<13.0	<6.00	<6.00	<6.00	<6.00	<7200
4-Methyl-2-pentanone (ug/kg)	<13.0	<26.0	<12.0	<12.0	<12.0	<12.0	72000
Toluene (ug/kg)	11	260	16	21	9	5	28000
Ethylbenzene (ug/kg)	<6.00	<13.0	<6.00	<6.00	<6.00	<6.00	52000
Xylenes (total) (ug/kg)	<6.00	<13.0	<6.00	<6.00	<6.00	<6.00	22000

Notes: NA = Not Analyzed

< = Detection Limit

ug/kg = micrograms per kilogram

Data not validated by JMM

TABLE 9-4

**SITE 7C - BUILDING 547, SERVICE STATION
RESULTS FOR VOLATILE ORGANIC COMPOUNDS AND
ETHYLENE DIBROMIDE DETECTED IN SOIL SAMPLES
(Sheet 6 of 7)**

Parameter Reported	MW547-3 07/02/90 5-5.5 ft	MW547-3 07/02/90 8-8.5 ft	MW547-3 07/02/90 10.5-11 ft	MW547-3 07/02/90 14-14.5 ft	MW547-4 06/28/90 2-2.5 ft	MW547-4 06/28/90 5-5.5 ft	MW547-4 06/28/90 8-8.5 ft
Methylene Chloride (ug/kg)	24	31	59	26	4	<10.0	4
Acetone (ug/kg)	19	41	<12.0	<12.0	8	<19.0	7
1,2-Dichloroethane (ug/kg)	<6.20	<5.90	<6.10	<6.00	<5.00	<10.0	<6.00
2-Butanone (ug/kg)	<12.0	<12.0	<12.0	<12.0	<10.0	7	<12.0
Trichloroethene (ug/kg)	<6.20	<5.90	<6.10	<6.00	<5.00	<10.0	2
Benzene (ug/kg)	87	82	<6.10	<6.00	<5.00	29	<6.00
4-Methyl-2-pentanone (ug/kg)	<6.20	<5.90	<6.10	<6.00	<10.0	<19.0	<12.0
Toluene (ug/kg)	250	9	7	14	4	2	2
Ethylbenzene (ug/kg)	190	71	<6.10	<6.00	<5.00	130	<6.00
Xylenes (total) (ug/kg)	620	34	<6.10	<6.00	<5.00	3	<6.00

Notes: NA = Not Analyzed

< = Detection Limit

ug/kg = micrograms per kilogram

Data not validated by JMM

TABLE 9-4

**SITE 7C - BUILDING 547, SERVICE STATION
RESULTS FOR VOLATILE ORGANIC COMPOUNDS AND
ETHYLENE DIBROMIDE DETECTED IN SOIL SAMPLES
(Sheet 7 of 7)**

Parameter Reported	MW547-4 06/28/90 10.5-11 ft	MW547-4 06/28/90 14-14.5 ft	MW547-5 06/29/90 2-2.5 ft	MW547-5 06/29/90 5-5.5 ft	MW547-5 06/29/90 8-8.5 ft	MW547-5 06/29/90 11-11.5 ft	MW547-5 07/13/90 14-14.5 ft
Methylene Chloride (ug/kg)	5	4	<9.00	5	4	4	4
Acetone (ug/kg)	3	7	<17.0	11	12	7	9
1,2-Dichloroethane (ug/kg)	<6.00	<6.00	<9.00	<7.00	<6.00	<6.00	<6.00
2-Butanone (ug/kg)	<13.0	<12.0	<17.0	<13.0	3	<12.0	<12.0
Trichloroethene (ug/kg)	2	<6.00	2	<7.00	<6.00	<6.00	<6.00
Benzene (ug/kg)	<6.00	<6.00	<9.00	<7.00	<6.00	<6.00	<6.00
4-Methyl-2-pentanone (ug/kg)	<13.0	<12.0	<17.0	<13.0	<12.0	<12.0	<12.0
Toluene (ug/kg)	14	3	140	19	10	10	4
Ethylbenzene (ug/kg)	<6.00	<6.00	<9.00	<7.00	<6.00	<6.00	<6.00
Xylenes (total) (ug/kg)	<6.00	<6.00	<9.00	<7.00	<6.00	<6.00	<6.00

Notes: NA = Not Analyzed
 < = Detection Limit
 ug/kg = micrograms per kilogram
 Data not validated by JMM

TABLE 9-5

SITE 7C - BUILDING 547, SERVICE STATION
RESULTS FOR SEMIVOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
 (Sheet 1 of 8)

Parameter Reported	B547-10 07/02/90 2-2.5 ft	B547-10 07/02/90 5-5.5 ft	B547-10 07/02/90 14-14.5 ft	B547-6 07/02/90 6-6.5 ft	B547-6 07/02/90 9-9.5 ft	B547-6 07/02/90 11-11.5 ft	B547-6 07/02/90 14-14.5 ft
Phenol (ug/kg)	<360	<820	<390	<400	<380	<400	<400
Naphthalene (ug/kg)	<360	<820	<390	<400	<380	<400	<400
2-Methylnaphthalene (ug/kg)	<360	<820	<390	<400	<380	<400	<400
Acenaphthene (ug/kg)	<360	<820	<390	<400	<380	<400	<400
Fluorene (ug/kg)	<360	<820	<390	<400	<380	<400	<400
Phenanthrene (ug/kg)	<360	<820	<390	<400	<380	<400	<400
Anthracene (ug/kg)	<360	<820	<390	<400	<380	<400	<400
Di-n-butylphthalate (ug/kg)	390	860	440	400	590	3600	420
Fluoranthene (ug/kg)	<360	<820	<390	<400	<380	<400	<400
Pyrene (ug/kg)	<360	<820	<390	<400	<380	<400	<400
Benzo(a)anthracene (ug/kg)	<360	<820	<390	<400	<380	<400	<400
Chrysene (ug/kg)	<360	<820	<390	<400	<380	<400	<400
bis(2-Ethylhexyl)phthalate (ug/kg)	<360	<820	<390	<400	<380	<400	<400
Benzo(b)fluoranthene (ug/kg)	<360	<820	<390	<400	<380	<400	<400
Benzo(k)fluoranthene (ug/kg)	<360	<820	<390	<400	<380	<400	<400
Benzo(a)pyrene (ug/kg)	<360	<820	<390	<400	<380	<400	<400
Indeno(1,2,3-cd)pyrene (ug/kg)	<360	<820	<390	<400	<380	<400	<400
Benzo(g,h,i)perylene (ug/kg)	<360	<820	<390	<400	<380	<400	<400

Notes: NA = Not Analyzed

< = Detection Limit

ug/kg = micrograms per kilogram

Data not validated by JMM

TABLE 9-5

SITE 7C - BUILDING 547, SERVICE STATION
RESULTS FOR SEMIVOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
 (Sheet 2 of 8)

Parameter Reported	B547-7 06/28/90 0.5-1 ft	B547-7 06/28/90 2-2.5 ft	B547-7 06/28/90 5-5.5 ft	B547-7 06/28/90 8-8.5 ft	B547-7 06/28/90 11-11.5 ft	B547-7 06/28/90 14-14.5 ft	B547-8 07/03/90 3.5-4 ft
Phenol (ug/kg)	<340	<380	300	100	<390	<410	<340
Naphthalene (ug/kg)	<340	2900	9800	<390	<390	<410	2000
2-Methylnaphthalene (ug/kg)	<340	4100	9400	<390	<390	<410	4400
Acenaphthene (ug/kg)	<340	46	120	<390	<390	<410	<340
Fluorene (ug/kg)	<340	46	130	<390	<390	<410	<340
Phenanthrene (ug/kg)	<340	180	410	<390	<390	<410	<340
Anthracene (ug/kg)	<340	50	96	<390	<390	<410	<340
Di-n-butylphthalate (ug/kg)	<340	<380	<720	<390	<390	<410	<340
Fluoranthene (ug/kg)	<340	140	220	<390	<390	<410	<340
Pyrene (ug/kg)	<340	110	190	<390	<390	<410	<340
Benzo(a)anthracene (ug/kg)	<340	56	100	<390	<390	<410	<340
Chrysene (ug/kg)	<340	<380	88	<390	<390	<410	<340
bis(2-Ethylhexyl)phthalate (ug/kg)	620	320	110	450	490	230	<340
Benzo(b)fluoranthene (ug/kg)	<340	<380	<720	<390	<390	<410	<340
Benzo(k)fluoranthene (ug/kg)	<340	<380	<720	<390	<390	<410	<340
Benzo(a)pyrene (ug/kg)	<340	<380	<720	<390	<390	<410	<340
Indeno(1,2,3-cd)pyrene (ug/kg)	<340	<380	<720	<390	<390	<410	<340
Benzo(g,h,i)perylene (ug/kg)	<340	<380	<720	<390	<390	<410	<340

Notes: NA = Not Analyzed

< = Detection Limit

ug/kg = micrograms per kilogram

Data not validated by JMM

TABLE 9-5

SITE 7C - BUILDING 547, SERVICE STATION
RESULTS FOR SEMIVOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
 (Sheet 3 of 8)

Parameter Reported	B547-8 07/03/90 5-5.5 ft	B547-8 07/03/90 8-8.5 ft	B547-8 07/03/90 11-11.5 ft	B547-8 07/03/90 12.5-13 ft	B547-9 07/02/90 5-5.5 ft	B547-9 07/02/90 14-14.5 ft	MW547-1 06/29/90 0.5-1 ft
Phenol (ug/kg)	<700	<400	<400	<400	<400	<410	<350
Naphthalene (ug/kg)	<700	<400	<400	<400	<400	<410	<350
2-Methylnaphthalene (ug/kg)	1500	<400	<400	<400	<400	<410	<350
Acenaphthene (ug/kg)	<700	<400	<400	<400	<400	<410	<350
Fluorene (ug/kg)	<700	<400	<400	<400	<400	<410	<350
Phenanthrene (ug/kg)	<700	<400	<400	<400	<400	<410	<350
Anthracene (ug/kg)	<700	<400	<400	<400	<400	<410	<350
Di-n-butylphthalate (ug/kg)	2600	3200	6300	1400	1000	410	<350
Fluoranthene (ug/kg)	<700	<400	<400	<400	<400	<410	<350
Pyrene (ug/kg)	<700	<400	<400	<400	<400	<410	<350
Benzo(a)anthracene (ug/kg)	<700	<400	<400	<400	<400	<410	<350
Chrysene (ug/kg)	<700	<400	<400	<400	<400	<410	<350
bis(2-Ethylhexyl)phthalate (ug/kg)	<700	<400	<400	<400	<400	<410	66
Benzo(b)fluoranthene (ug/kg)	<700	<400	<400	<400	<400	<410	<350
Benzo(k)fluoranthene (ug/kg)	<700	<400	<400	<400	<400	<410	<350
Benzo(a)pyrene (ug/kg)	<700	<400	<400	<400	<400	<410	<350
Indeno(1,2,3-cd)pyrene (ug/kg)	<700	<400	<400	<400	<400	<410	<350
Benzo(g,h,i)perylene (ug/kg)	<700	<400	<400	<400	<400	<410	<350

Notes: NA = Not Analyzed

< = Detection Limit

ug/kg = micrograms per kilogram

Data not validated by JMM

TABLE 9-5

SITE 7C - BUILDING 547, SERVICE STATION
RESULTS FOR SEMIVOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 4 of 8)

Parameter Reported	MW547-1 06/29/90 4.5-5 ft	MW547-1 06/29/90 8-8.5 ft	MW547-1 06/29/90 11-11.5 ft	MW547-1 06/29/90 14-14.5 ft	MW547-2 06/29/90 0.5-1 ft	MW547-2 06/29/90 2-2.5 ft	MW547-2 06/29/90 5-5.5 ft
Phenol (ug/kg)	<400	<400	<400	<400	<340	<340	<370
Naphthalene (ug/kg)	<400	<400	<400	<400	<340	<340	<370
2-Methylnaphthalene (ug/kg)	<400	<400	<400	<400	<340	<340	<370
Acenaphthene (ug/kg)	<400	<400	<400	<400	<340	<340	<370
Fluorene (ug/kg)	<400	<400	<400	<400	<340	<340	<370
Phenanthrene (ug/kg)	<400	<400	<400	<400	57	<340	<370
Anthracene (ug/kg)	<400	<400	<400	<400	<340	<340	<370
Di-n-butylphthalate (ug/kg)	<400	<400	<400	<400	90	<340	<370
Fluoranthene (ug/kg)	<400	<400	<400	<400	76	<340	<370
Pyrene (ug/kg)	<400	<400	<400	<400	93	<340	<370
Benzo(a)anthracene (ug/kg)	<400	<400	<400	<400	61	<340	<370
Chrysene (ug/kg)	<400	<400	<400	<400	58	<340	<370
bis(2-Ethylhexyl)phthalate (ug/kg)	69	130	120	220	91	100	210
Benzo(b)fluoranthene (ug/kg)	<400	<400	<400	<400	<340	<340	<370
Benzo(k)fluoranthene (ug/kg)	<400	<400	<400	<400	<340	<340	<370
Benzo(a)pyrene (ug/kg)	<400	<400	<400	<400	48	<340	<370
Indeno(1,2,3-cd)pyrene (ug/kg)	<400	<400	<400	<400	<340	<340	<370
Benzo(g,h,i)perylene (ug/kg)	<400	<400	<400	<400	<340	<340	<370

Notes: NA = Not Analyzed

< = Detection Limit

ug/kg = micrograms per kilogram

Data not validated by JMM

TABLE 9-5

SITE 7C - BUILDING 547, SERVICE STATION
RESULTS FOR SEMIVOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 5 of 8)

Parameter Reported	MW547-2 06/29/90 5.5-6 ft	MW547-2 06/29/90 9.5-10 ft	MW547-2 06/29/90 12.5-13 ft	MW547-2 06/29/90 14-14.5 ft	MW547-3 07/02/90 3.5-4 ft	MW547-3 07/02/90 5-5.5 ft	MW547-3 07/02/90 10.5-11 ft
Phenol (ug/kg)	<380	<450	<380	<400	<1500	<410	<400
Naphthalene (ug/kg)	<380	<450	<380	<400	16000	<410	<400
2-Methylnaphthalene (ug/kg)	<380	<450	<380	<400	16000	<410	<400
Acenaphthene (ug/kg)	<380	<450	<380	<400	<380	<410	<400
Fluorene (ug/kg)	<380	<450	<380	<400	<380	<410	<400
Phenanthrene (ug/kg)	<380	<450	<380	<400	<380	<410	<400
Anthracene (ug/kg)	<380	<450	<380	<400	<380	<410	<400
Di-n-butylphthalate (ug/kg)	<380	280	<380	<400	<380	540	650
Fluoranthene (ug/kg)	<380	<450	<380	<400	<380	<410	<400
Pyrene (ug/kg)	<380	<450	<380	<400	<380	<410	<400
Benzo(a)anthracene (ug/kg)	<380	<450	<380	<400	<380	<410	<400
Chrysene (ug/kg)	<380	<450	<380	<400	<380	<410	<400
bis(2-Ethylhexyl)phthalate (ug/kg)	670	1600	3600	1400	<380	<410	<400
Benzo(b)fluoranthene (ug/kg)	<380	<450	<380	<400	<380	<410	<400
Benzo(k)fluoranthene (ug/kg)	<380	<450	<380	<400	<380	<410	<400
Benzo(a)pyrene (ug/kg)	<380	<450	<380	<400	<380	<410	<400
Indeno(1,2,3-cd)pyrene (ug/kg)	<380	<450	<380	<400	<380	<410	<400
Benzo(g,h,i)perylene (ug/kg)	<380	<450	<380	<400	<380	<410	<400

Notes: NA = Not Analyzed

< = Detection Limit

ug/kg = micrograms per kilogram

Data not validated by JMM

TABLE 9-5

SITE 7C - BUILDING 547, SERVICE STATION
RESULTS FOR SEMIVOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
 (Sheet 6 of 8)

Parameter Reported	MW547-3 07/02/90 11.5-12 ft	MW547-3 07/02/90 14-14.5 ft	MW547-4 06/28/90 0.5-1 ft	MW547-4 06/29/90 2.5-3 ft	MW547-4 06/28/90 5.5-6 ft	MW547-4 06/28/90 8.5-9 ft	MW547-4 06/28/90 11-11.5 ft
Phenol (ug/kg)	<400	<390	<330	<350	<380	<400	<410
Naphthalene (ug/kg)	<400	<390	<330	<350	100	<400	<410
2-Methylnaphthalene (ug/kg)	<400	<390	<330	<350	<380	<400	<410
Acenaphthene (ug/kg)	<400	<390	<330	<350	<380	<400	<410
Fluorene (ug/kg)	<400	<390	<330	<350	<380	<400	<410
Phenanthrene (ug/kg)	<400	<390	<330	<350	<380	<400	<410
Anthracene (ug/kg)	<400	<390	<330	<350	<380	<400	<410
Di-n-butylphthalate (ug/kg)	480	3000	<330	<350	<380	<400	<410
Fluoranthene (ug/kg)	<400	<390	<330	<350	<380	<400	<410
Pyrene (ug/kg)	<400	<390	<330	<350	<380	<400	<410
Benzo(a)anthracene (ug/kg)	<400	<390	<330	<350	<380	<400	<410
Chrysene (ug/kg)	<400	<390	<330	<350	<380	<400	<410
bis(2-Ethylhexyl)phthalate (ug/kg)	<400	<390	95	69	130	340	150
Benzo(b)fluoranthene (ug/kg)	<400	<390	<330	<350	<380	<400	<410
Benzo(k)fluoranthene (ug/kg)	<400	<390	<330	<350	<380	<400	<410
Benzo(a)pyrene (ug/kg)	<400	<390	<330	<350	<380	<400	<410
Indeno(1,2,3-cd)pyrene (ug/kg)	<400	<390	<330	<350	<380	<400	<410
Benzo(g,h,i)perylene (ug/kg)	<400	<390	<330	<350	<380	<400	<410

Notes: NA = Not Analyzed
 < = Detection Limit
 ug/kg = micrograms per kilogram
 Data not validated by JMM

TABLE 9-5

SITE 7C - BUILDING 547, SERVICE STATION
RESULTS FOR SEMIVOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 7 of 8)

Parameter Reported	MW547-4 06/28/90 14.5-15 ft	MW547-5 06/29/90 0.5-1 ft	MW547-5 06/29/90 2-2.5 ft	MW547-5 06/29/90 5-5.5 ft	MW547-5 06/29/90 8-8.5 ft	MW547-5 06/29/90 10.5-11 ft	MW547-5 06/29/90 11-11.5 ft
Phenol (ug/kg)	<410	<350	<340	<400	<390	<400	<390
Naphthalene (ug/kg)	<410	<350	<340	<400	<390	<400	<390
2-Methylnaphthalene (ug/kg)	<410	<350	<340	<400	<390	<400	<390
Acenaphthene (ug/kg)	<410	<350	<340	<400	<390	<400	<390
Fluorene (ug/kg)	<410	<350	<340	<400	<390	<400	<390
Phenanthrene (ug/kg)	<410	<350	<340	<400	<390	<400	<390
Anthracene (ug/kg)	<410	<350	<340	<400	<390	<400	<390
Di-n-butylphthalate (ug/kg)	<410	<350	44	<400	<390	<400	<390
Fluoranthene (ug/kg)	<410	<350	<340	300	<390	<400	<390
Pyrene (ug/kg)	<410	<350	<340	340	<390	<400	<390
Benzo(a)anthracene (ug/kg)	<410	<350	<340	88	<390	<400	<390
Chrysene (ug/kg)	<410	<350	<340	140	<390	<400	<390
bis(2-Ethylhexyl)phthalate (ug/kg)	170	210	310	1300	330	180	130
Benzo(b)fluoranthene (ug/kg)	<410	<350	<340	94	<390	<400	<390
Benzo(k)fluoranthene (ug/kg)	<410	<350	<340	120	<390	<400	<390
Benzo(a)pyrene (ug/kg)	<410	<350	<340	140	<390	<400	<390
Indeno(1,2,3-cd)pyrene (ug/kg)	<410	<350	<340	140	<390	<400	<390
Benzo(g,h,i)perylene (ug/kg)	<410	<350	<340	160	<390	<400	<390

Notes: NA = Not Analyzed

< = Detection Limit

ug/kg = micrograms per kilogram

Data not validated by JMM

TABLE 9-5

SITE 7C - BUILDING 547, SERVICE STATION
RESULTS FOR SEMIVOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 8 of 8)

Parameter Reported	MW547-5 07/13/90 14-14.5 ft
Phenol (ug/kg)	<390
Naphthalene (ug/kg)	<390
2-Methylnaphthalene (ug/kg)	<390
Acenaphthene (ug/kg)	<390
Fluorene (ug/kg)	<390
Phenanthrene (ug/kg)	<390
Anthracene (ug/kg)	<390
Di-n-butylphthalate (ug/kg)	<390
Fluoranthene (ug/kg)	<390
Pyrene (ug/kg)	<390
Benzo(a)anthracene (ug/kg)	<390
Chrysene (ug/kg)	<390
bis(2-Ethylhexyl)phthalate (ug/kg)	650
Benzo(b)fluoranthene (ug/kg)	<390
Benzo(k)fluoranthene (ug/kg)	<390
Benzo(a)pyrene (ug/kg)	<390
Indeno(1,2,3-cd)pyrene (ug/kg)	<390
Benzo(g,h,i)perylene (ug/kg)	<390

Notes: NA = Not Analyzed

< = Detection Limit

ug/kg = micrograms per kilogram

Data not validated by JMM

TABLE 9-6

SITE 7C - BUILDING 547, SERVICE STATION
RESULTS FOR TOTAL RECOVERABLE PETROLEUM HYDROCARBONS DETECTED IN SOIL SAMPLES

Parameter Reported	B547-10 07/02/90 1-1.5 ft	B547-10 07/02/90 2.5-3 ft	B547-10 07/02/90 5.5-6 ft	B547-6 07/02/90 2.5-3 ft	B547-6 07/02/90 3.5-4 ft	B547-7 06/28/90 0.5-1 ft	B547-7 06/28/90 2.5-3 ft
TRPH (mg/kg)	4.7	2.8	24.4	98.6	172	4.8	31.2
Parameter Reported	B547-7 06/28/90 5.5-6 ft	B547-8 07/03/90 4-4.5 ft	B547-8 07/03/90 5.5-6 ft	B547-9 07/03/90 2.5-3 ft	MW547-1 06/29/90 0.5-1 ft	MW547-2 06/29/90 0.5-1 ft	MW547-2 06/29/90 2.5-3 ft
TRPH (mg/kg)	10800	199	429	255	308	30.4	4
Parameter Reported	MW547-3 07/13/90 2-2.5 ft	MW547-3 07/02/90 4-4.5 ft	MW547-3 07/02/90 5.5-6 ft	MW547-5 06/29/90 0.5-1 ft	MW547-5 06/29/90 2.5-3 ft	MW547-5 06/29/90 5.5-6 ft	MW547-5 06/29/90 8.5-9 ft
TRPH (mg/kg)	4.7	45.3	119	35.8	3.8	99.7	6.5

Notes: NA = Not Analyzed

< = Detection Limit

mg/kg = milligrams per kilogram

Data not validated by JMM

TABLE 9-7

**SITE 7C - BUILDING 547, SERVICE STATION
RESULTS FOR PESTICIDE COMPOUNDS DETECTED IN SOIL SAMPLES**

Parameter Reported	B547-10 07/02/90 0.5-1 ft	B547-10 07/02/90 5.5-6 ft	B547-8 07/03/90 1-1.5 ft	MW547-3 07/02/90 1-1.5 ft	MW547-3 07/02/90 5.5-6 ft	MW547-5 06/29/90 0.5-1 ft	MW547-5 06/29/90 2.5-3 ft
4,4'-DDD (ug/kg)	<2.20	<2.40	<2.20	2.4	<3.40	9	<33.0
4,4'-DDE (ug/kg)	15	<2.40	6.1	12	<3.40	23	<33.0
4,4'-DDT (ug/kg)	10	<2.40	<2.20	<2.20	<3.40	53	2.7
Methoxychlor (ug/kg)	<5.40	11	<5.40	<5.60	20	<420	<170
alpha-Chlordane (ug/kg)	NA	NA	NA	NA	NA	27	0.9
gamma-Chlordane (ug/kg)	NA	NA	NA	NA	NA	22	1.4

Notes: NA = Not Analyzed

< = Detection Limit

ug/kg = micrograms per kilogram

Data not validated by JMM

TABLE 9-8

SITE 7C - BUILDING 547, SERVICE STATION
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
 (Sheet 1 of 9)

Parameter Reported	B547-10 07/02/90 0.5-1 ft	B547-10 07/02/90 2.5-3 ft	B547-10 07/02/90 5.5-6 ft	B547-10 07/02/90 8.5-9 ft	B547-10 07/02/90 11.5-12 ft	B547-10 07/02/90 14.5-15 ft	B547-6 07/02/90 2-2.5 ft
Aluminum (mg/kg)	14000	4980	7490	8190	16000	12800	6810
Arsenic (mg/kg)	18	<11.0	<12.0	12	23	21	<10.0
Barium (mg/kg)	140	49	120	63	77	70	46
Beryllium (mg/kg)	<1.10	<1.10	<1.20	<1.20	<1.20	<1.20	<1.00
Cadmium (mg/kg)	<1.10	<1.10	<1.20	<1.20	<1.20	<1.20	<1.00
Calcium (mg/kg)	4600	2500	5200	3000	2800	2500	3800
Chromium (mg/kg)	38	25	30	35	56	52	27
Cobalt (mg/kg)	9.1	<5.40	<6.10	<6.10	9.3	7.2	<5.20
Copper (mg/kg)	41	8.3	28	10	14	16	23
Iron (mg/kg)	20500	7840	10600	12100	19400	17800	10900
Lead (mg/kg)	19	<5.40	41	<6.10	7.4	<6.00	<5.20
Magnesium (mg/kg)	4700	1700	2400	2600	4500	3400	3500
Manganese (mg/kg)	220	110	300	200	190	180	160
Nickel (mg/kg)	47	23	27	35	70	53	24
Potassium (mg/kg)	2000	680	1300	1000	1400	1200	790
Selenium (mg/kg)	<11.0	<11.0	<12.0	<12.0	<12.0	<12.0	<10.0
Silver (mg/kg)	<5.40	<5.40	<6.10	<6.10	<6.00	<6.00	<5.20
Sodium (mg/kg)	<540	<540	<610	<610	<600	<600	<520
Titanium (mg/kg)	500	410	390	490	696	600	516
Vanadium (mg/kg)	39	18	22	21	42	34	29
Zinc (mg/kg)	84	20	67	23	33	30	25

Notes: NA = Not Analyzed

< = Detection Limit

mg/kg = milligrams per kilogram

Data not validated by JMM

TABLE 9-8

**SITE 7C - BUILDING 547, SERVICE STATION
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
(Sheet 2 of 9)**

Parameter Reported	B547-6 07/02/90 5-5.5 ft	B547-6 07/02/90 6.5-7 ft	B547-6 07/02/90 9.5-10 ft	B547-6 07/02/90 11.5-12 ft	B547-6 07/02/90 14.5-15 ft	B547-7 06/28/90 0.5-1 ft	B547-7 06/28/90 2.5-3 ft
Aluminum (mg/kg)	6470	5060	10500	15100	9250	7870	3970
Arsenic (mg/kg)	<12.0	<12.0	15	16	17	2.7	<2.50
Barium (mg/kg)	51	33	64	87	66	69.4	26.5
Beryllium (mg/kg)	<1.20	<1.20	<1.20	<1.20	<1.20	0.3	<0.200
Cadmium (mg/kg)	<1.20	<1.20	<1.20	<1.20	<1.20	0.4	0.5
Calcium (mg/kg)	1800	1700	2000	2200	2000	3100	574
Chromium (mg/kg)	30	29	38	62	41	34	28.1
Cobalt (mg/kg)	<5.90	<5.80	6.5	7.8	6.3	5.9	3.9
Copper (mg/kg)	6.9	6.1	11	11	9.6	22.2	14.6
Iron (mg/kg)	8760	8370	14900	16600	14000	11800	6830
Lead (mg/kg)	<5.90	<5.80	<5.90	<6.00	<6.00	15.3	8.3
Magnesium (mg/kg)	1700	1700	3000	3700	2900	2960	1920
Manganese (mg/kg)	160	110	220	170	180	166	84.7
Nickel (mg/kg)	21	21	46	57	43	29.3	22.4
Potassium (mg/kg)	820	650	1000	860	860	1370	647
Selenium (mg/kg)	<12.0	<12.0	<12.0	<12.0	<12.0	<4.50	<4.30
Silver (mg/kg)	<5.90	<5.80	<5.90	<6.00	<6.00	<0.600	<0.600
Sodium (mg/kg)	<590	<580	730	810	<600	268	217
Titanium (mg/kg)	440	340	556	646	540	473	387
Vanadium (mg/kg)	21	20	30	33	29	23.1	16.9
Zinc (mg/kg)	17	14	26	30	25	46.7	22.3

Notes: NA = Not Analyzed

< = Detection Limit

mg/kg = milligrams per kilogram

Data not validated by JMM

TABLE 9-8

SITE 7C - BUILDING 547, SERVICE STATION
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
(Sheet 3 of 9)

Parameter Reported	B547-7 06/28/90 5.5-6 ft	B547-7 06/28/90 8.5-9 ft	B547-7 06/28/90 9-9.5 ft	B547-7 06/28/90 11.5-12 ft	B547-7 06/28/90 14.5-15 ft	B547-8 07/03/90 1-1.5 ft	B547-8 07/03/90 4-4.5 ft
Aluminum (mg/kg)	3280	11800	14800	9170	8590	5650	6220
Arsenic (mg/kg)	<2.80	3	3.5	3	<2.90	<11.0	<11.0
Barium (mg/kg)	27	68.8	82.2	91	72.5	56	29
Beryllium (mg/kg)	<0.200	0.4	0.4	0.3	0.3	<1.10	<1.10
Cadmium (mg/kg)	0.3	0.5	0.4	0.4	0.4	<1.10	<1.10
Calcium (mg/kg)	1920	1840	2300	2200	2310	3700	3200
Chromium (mg/kg)	24.9	46.7	67.5	37.1	41.1	41	33
Cobalt (mg/kg)	4.1	10	9.1	8.2	7.2	<5.40	<5.40
Copper (mg/kg)	7.1	17.3	12.7	16.9	11.4	18	5.6
Iron (mg/kg)	6330	17000	18200	14400	13600	9720	8790
Lead (mg/kg)	8.5	8.1	7.9	<60	<6.00	25	<5.40
Magnesium (mg/kg)	1880	3440	4180	4030	3520	2100	2300
Manganese (mg/kg)	73.8	181.1	136	157	188	150	100
Nickel (mg/kg)	22.1	54.8	53.1	54.7	49.6	27	27
Potassium (mg/kg)	614	1320	1510	693	1050	660	810
Selenium (mg/kg)	<5.00	<5.20	<5.00	<5.10	<5.00	<11.0	<11.0
Silver (mg/kg)	<0.700	<0.700	0.7	<0.700	<0.700	<5.40	<5.40
Sodium (mg/kg)	135	174	211	303	270	<540	<540
Titanium (mg/kg)	310	403	624	394	447	440	590
Vanadium (mg/kg)	15.4	34.5	33.8	26.8	24.1	23	24
Zinc (mg/kg)	19.9	32.5	37	3880	33.9	49	18

Notes: NA = Not Analyzed

< = Detection Limit

mg/kg = milligrams per kilogram

Data not validated by JMM

TABLE 9-8

**SITE 7C - BUILDING 547, SERVICE STATION
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
(Sheet 4 of 9)**

Parameter Reported	B547-8 07/03/90 5.5-6 ft	B547-8 07/03/90 8.5-9 ft	B547-8 07/03/90 11.5-12 ft	B547-8 07/03/90 13-13.5 ft	B547-9 07/02/90 1-1.5 ft	B547-9 07/02/90 4-4.5 ft	B547-9 07/02/90 5.5-6 ft
Aluminum (mg/kg)	8460	6270	11100	10200	3700	6920	6830
Arsenic (mg/kg)	<13.0	<12.0	<12.0	<12.0	<11.0	<12.0	<12.0
Barium (mg/kg)	48	43	63	72	48	65	46
Beryllium (mg/kg)	<1.30	<1.20	<1.20	<1.20	<1.10	<1.20	<1.20
Cadmium (mg/kg)	<1.30	<1.20	<1.20	<1.20	<1.10	<1.20	<1.20
Calcium (mg/kg)	3400	1700	2100	2200	2500	2100	1700
Chromium (mg/kg)	43	29	36	39	21	30	28
Cobalt (mg/kg)	6.9	<6.00	6.7	7.4	<5.30	<5.90	<5.90
Copper (mg/kg)	10	7.5	8.8	11	14	8.9	12
Iron (mg/kg)	13600	9050	15000	16300	7630	9130	9570
Lead (mg/kg)	<6.30	<6.00	<5.80	<6.10	9.8	<5.90	<5.90
Magnesium (mg/kg)	3800	2000	2900	3300	1800	1600	1700
Manganese (mg/kg)	130	130	160	240	140	99	220
Nickel (mg/kg)	45	25	43	54	22	23	22
Potassium (mg/kg)	1400	890	1400	1200	<530	970	800
Selenium (mg/kg)	<13.0	<12.0	<12.0	<12.0	<11.0	<12.0	<12.0
Silver (mg/kg)	<6.30	<6.00	<5.80	<6.10	<5.30	<5.90	<5.90
Sodium (mg/kg)	<630	<600	820	850	<530	<590	<590
Titanium (mg/kg)	660	400	529	550	300	450	430
Vanadium (mg/kg)	29	20	29	30	16	23	24
Zinc (mg/kg)	30	17	25	34	29	20	20

Notes: NA = Not Analyzed

< = Detection Limit

mg/kg = milligrams per kilogram

Data not validated by JMM

TABLE 9-8

SITE 7C - BUILDING 547, SERVICE STATION
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
 (Sheet 5 of 9)

Parameter Reported	B547-9 07/02/90 8.5-9 ft	B547-9 07/02/90 11.5-12 ft	B547-9 07/02/90 14.5-15 ft	MW547-1 06/29/90 0.5-1 ft	MW547-1 06/29/90 2.5-3 ft	MW547-1 06/29/90 5-5.5 ft	MW547-1 06/29/90 8.5-9 ft
Aluminum (mg/kg)	15100	15000	8200	26800	3960	5160	15800
Arsenic (mg/kg)	17	17	16	<2.50	<2.50	<2.80	3.5
Barium (mg/kg)	110	91	60	47.3	0.3	57.3	107
Beryllium (mg/kg)	<1.30	<1.20	<1.20	0.3	<0.200	<0.200	0.5
Cadmium (mg/kg)	<1.30	<1.20	<1.20	0.6	<0.200	<0.200	0.4
Calcium (mg/kg)	2600	2200	2300	15500	3480	1360	2490
Chromium (mg/kg)	52	55	37	11.4	25.6	28.6	71.8
Cobalt (mg/kg)	6.8	<6.00	<6.00	10.4	3.7	4.7	9.1
Copper (mg/kg)	13	11	13	86.2	5.8	7.1	40.8
Iron (mg/kg)	19600	16900	12700	21400	6410	8310	19400
Lead (mg/kg)	7.4	6.7	<6.00	13.1	<5.30	<5.80	6.5
Magnesium (mg/kg)	4100	3800	2800	6800	1870	1510	3860
Manganese (mg/kg)	150	130	160	352	84.2	148	177
Nickel (mg/kg)	62	61	40	11.6	21.1	18.6	60
Potassium (mg/kg)	800	900	820	1090	497	736	1120
Selenium (mg/kg)	<13.0	<12.0	<12.0	<4.40	<4.40	<4.80	<5.00
Silver (mg/kg)	<6.40	<6.00	<6.00	<0.600	<0.600	<0.700	<0.700
Sodium (mg/kg)	880	<600	<600	1810	139	348	1220
Titanium (mg/kg)	600	628	530	466	368	335	567
Vanadium (mg/kg)	37	31	26	62.3	15.9	19.1	35.1
Zinc (mg/kg)	34	29	25	60.2	18.1	19.2	56.9

Notes: NA = Not Analyzed

< = Detection Limit

mg/kg = milligrams per kilogram

Data not validated by JMM

TABLE 9-8

**SITE 7C - BUILDING 547, SERVICE STATION
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
(Sheet 6 of 9)**

Parameter Reported	MW547-1 06/29/90 11.5-12 ft	MW547-1 06/29/90 14.5-15 ft	MW547-2 06/29/90 0.5-1 ft	MW547-2 06/29/90 2.5-3 ft	MW547-2 06/29/90 6-6.5 ft	MW547-2 06/29/90 6.5-7 ft	MW547-2 06/29/90 10-10.5 ft
Aluminum (mg/kg)	7530	8030	4280	5160	6330	15000	10800
Arsenic (mg/kg)	3	<2.80	<2.50	<2.70	<2.70	2.9	3.2
Barium (mg/kg)	77.1	58.3	49	106	37.7	68.9	90.4
Beryllium (mg/kg)	0.3	0.3	<0.200	<0.200	0.3	<0.200	0.4
Cadmium (mg/kg)	0.3	0.4	<0.200	0.4	0.2	0.5	0.6
Calcium (mg/kg)	1880	2180	2120	2930	1860	1780	1750
Chromium (mg/kg)	34.4	43.9	29.1	26.6	41.6	56.1	54.7
Cobalt (mg/kg)	7.3	6.1	4.1	4.8	7.1	8.2	6
Copper (mg/kg)	12.6	14.7	22	21	8.9	18.6	29.2
Iron (mg/kg)	12300	12400	760	8900	9880	19500	17100
Lead (mg/kg)	6.1	<5.70	7.4	27.3	<5.70	8.7	<5.90
Magnesium (mg/kg)	3320	3070	1910	1800	2290	3850	42400
Manganese (mg/kg)	186	150	156	268	137	173	145
Nickel (mg/kg)	45.9	40.6	23.2	19.7	27.4	54.2	54.4
Potassium (mg/kg)	629	808	651	829	895	1460	607
Selenium (mg/kg)	<5.00	<4.80	<4.30	<4.80	<4.80	<5.00	5.7
Silver (mg/kg)	<0.700	<0.700	<0.600	<0.700	<0.700	<0.700	<0.700
Sodium (mg/kg)	543	136	147	240	241	919	830
Titanium (mg/kg)	276	473	308	280	377	704	407
Vanadium (mg/kg)	20	24.6	17.5	18.3	22.4	37.7	32.8
Zinc (mg/kg)	29.3	36.9	27.5	61.4	20.9	41.4	39.3

Notes: NA = Not Analyzed

< = Detection Limit

mg/kg = milligrams per kilogram

Data not validated by JMM

TABLE 9-8

SITE 7C - BUILDING 547, SERVICE STATION
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
 (Sheet 7 of 9)

Parameter Reported	MW547-2 06/29/90 13-13.5 ft	MW547-2 06/29/90 14.5-15 ft	MW547-3 07/02/90 1-1.5 ft	MW547-3 07/02/90 4-4.5 ft	MW547-3 07/02/90 5.5-6 ft	MW547-3 07/02/90 8.5-9 ft	MW547-3 07/13/90 11-11.5 ft
Aluminum (mg/kg)	8120	5610	7500	3430	14000	4330	9720
Arsenic (mg/kg)	5.3	<2.80	<11.0	<11.0	24	14	<12.0
Barium (mg/kg)	66.6	58.7	120	24	110	200	72
Beryllium (mg/kg)	0.3	0.3	<1.10	<1.10	<1.70	<1.20	<1.20
Cadmium (mg/kg)	<0.200	0.3	<1.10	<1.10	<1.70	<1.20	<1.20
Calcium (mg/kg)	1890	1460	2600	1600	3400	1600	1400
Chromium (mg/kg)	38.4	34.6	28	24	67	28	38
Cobalt (mg/kg)	6.6	6.5	9.2	<5.40	17	9.8	7.3
Copper (mg/kg)	10.2	9.2	39	7.5	40	13	12
Iron (mg/kg)	13800	11000	14100	6550	29600	20800	15000
Lead (mg/kg)	<5.80	<5.90	48	7	30	<5.80	<6.00
Magnesium (mg/kg)	3180	2880	3100	1900	7100	1800	3400
Manganese (mg/kg)	158	156	230	90	440	734	180
Nickel (mg/kg)	45.9	40.4	31	24	89	32	54
Potassium (mg/kg)	743	538	1400	<540	2300	750	610
Selenium (mg/kg)	<4.90	<4.90	<11.0	<11.0	<17.0	<12.0	<12.0
Silver (mg/kg)	<0.700	<0.700	<5.60	<5.40	<8.40	<5.80	<6.00
Sodium (mg/kg)	415	278	<560	<540	1400	<580	610
Titanium (mg/kg)	415	273	350	330	590	260	330
Vanadium (mg/kg)	26	20.2	25	15	57	43	28
Zinc (mg/kg)	29.8	27	78	18	84	21	26

Notes: NA = Not Analyzed

< = Detection Limit

mg/kg = milligrams per kilogram

Data not validated by JMM

TABLE 9-8

SITE 7C - BUILDING 547, SERVICE STATION
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
(Sheet 8 of 9)

Parameter Reported	MW547-3 07/02/90 14.5-15 ft	MW547-4 06/28/90 0.5-1 ft	MW547-4 06/29/90 2.5-3 ft	MW547-4 06/28/90 5.5-6 ft	MW547-4 06/28/90 8.5-9 ft	MW547-4 06/28/90 11-11.5 ft	MW547-4 06/28/90 14.5-15 ft
Aluminum (mg/kg)	10100	4520	3120	4500	11000	8440	8670
Arsenic (mg/kg)	<12.0	<2.50	<2.60	<3.00	4.1	3.1	4.1
Barium (mg/kg)	83	58.4	25.2	66.7	56.1	63.5	64.7
Beryllium (mg/kg)	<1.20	<0.200	<0.200	<0.300	0.3	0.4	0.3
Cadmium (mg/kg)	<1.20	<0.200	0.3	0.4	0.6	0.3	0.3
Calcium (mg/kg)	1700	3500	1840	1790	1740	15.3	2230
Chromium (mg/kg)	46	27.9	26.9	27.2	51.7	36.2	41.9
Cobalt (mg/kg)	<6.10	4.3	4.1	4.6	8.1	5.7	6.9
Copper (mg/kg)	13	16.3	6.2	8.2	10.1	10	9.9
Iron (mg/kg)	8660	7100	5830	8260	14900	13600	13200
Lead (mg/kg)	<6.10	<5.20	<5.30	8.1	<5.90	<5.90	<6.10
Magnesium (mg/kg)	2600	2050	1680	1650	3630	3000	3060
Manganese (mg/kg)	100	93.4	72.4	185	188	120	168
Nickel (mg/kg)	40	21.5	20.2	21.7	50.8	46.4	44.1
Potassium (mg/kg)	<610	601	521	801	924	774	850
Selenium (mg/kg)	<12.0	<4.30	<4.50	<5.30	<5.00	<5.00	<5.20
Silver (mg/kg)	<6.10	<0.600	<0.600	<0.800	<0.700	<0.700	<0.700
Sodium (mg/kg)	840	182	112	241	950	1080	821
Titanium (mg/kg)	320	372	264	258	304	325	477
Vanadium (mg/kg)	17	17.3	13.9	16.3	28.6	23.1	24.6
Zinc (mg/kg)	27	25.8	18	30.1	30.9	29.5	30.5

Notes: NA = Not Analyzed
< = Detection Limit
mg/kg = milligrams per kilogram
Data not validated by JMM

TABLE 9-8

SITE 7C - BUILDING 547, SERVICE STATION
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
(Sheet 9 of 9)

Parameter Reported	MW547-5 06/29/90 0.5-1 ft	MW547-5 06/29/90 2.5-3 ft	MW547-5 06/29/90 5.5-6 ft	MW547-5 06/29/90 8.5-9 ft	MW547-5 06/29/90 11.5-12 ft	MW547-5 06/29/90 12-12.5 ft	MW547-5 06/29/90 14.5-15 ft
Aluminum (mg/kg)	6310	3900	8360	4080	10400	15000	9550
Arsenic (mg/kg)	4.9	2.9	5.6	<2.90	3.6	3.8	3
Barium (mg/kg)	81	33.7	58.7	58.7	66.2	83.7	64.8
Beryllium (mg/kg)	0.2	<0.200	0.4	<0.200	0.4	0.4	0.3
Cadmium (mg/kg)	1	<0.200	0.5	<0.200	0.3	0.5	0.4
Calcium (mg/kg)	3350	2110	3440	1660	1810	2480	2000
Chromium (mg/kg)	50.8	26.9	56.9	22.9	42.8	58.5	42.9
Cobalt (mg/kg)	6.6	3.6	7.3	4.4	6.8	7.8	6.2
Copper (mg/kg)	33.8	9.5	14.7	7.7	15.3	17.1	24.1
Iron (mg/kg)	9640	6930	14100	7750	14800	18800	14300
Lead (mg/kg)	9890	<5.20	15.8	<6.00	<6.00	8.3	6.7
Magnesium (mg/kg)	2220	1900	3690	1770	3530	4420	3350
Manganese (mg/kg)	210	95.2	158	152	155	197	142
Nickel (mg/kg)	32.6	22.3	44.3	20.1	53	64.9	50.9
Potassium (mg/kg)	1250	622	1360	533	892	1090	856
Selenium (mg/kg)	<4.40	<4.40	<5.10	<5.00	<5.00	<5.00	<5.00
Silver (mg/kg)	1.2	<0.600	<0.700	<0.700	<0.700	<0.700	<0.700
Sodium (mg/kg)	209	142	296	269	831	1110	855
Titanium (mg/kg)	346	330	616	183	395	580	413
Vanadium (mg/kg)	21.2	16.4	29.6	14.5	26.4	32.3	26.3
Zinc (mg/kg)	151	27.7	47.3	22.5	36.4	43	35.5

Notes: NA = Not Analyzed

< = Detection Limit

mg/kg = milligrams per kilogram

Data not validated by JMM

TABLE 9-9

SITE 7C - BUILDING 547, SERVICE STATION
RESULTS FOR GENERAL CHEMICAL CHARACTERISTICS IN SOIL SAMPLES
 (Sheet 1 of 2)

Parameter Reported	B547-10 07/02/90 1-1.5 ft	B547-6 07/02/90 2.5-3 ft	B547-6 07/02/90 3.5-4 ft	B547-7 06/28/90 1-1.5 ft	B547-8 07/03/90 2-2.5 ft	B547-8 07/03/90 3.5-4 ft	B547-8 07/03/90 5-5.5 ft
Miscellaneous Measurements							
Ash (%)	98.1	99.2	98	91	99.2	NA	NA
Chloride (mg/kg)	17.4	10.4	14	49.8	9.8	NA	NA
Exchangeable Ammonium-N (mg/kg)	<25.0	33.6	<25.0	<25.0	<25.0	NA	NA
Nitrate (as Nitrogen) (mg/kg)	0.24	2.23	0.2	<0.160	<0.160	NA	NA
Sulfate (mg/kg)	53.7	10.2	32.2	27.1	8.7	NA	NA
Total Kjeldahl Nitrogen (mg/kg)	554	95.2	168	258	101	NA	NA
Total Phosphorus (mg/kg)	666	280	524	368	272	NA	NA
Total Organic Carbon							
Total Organic Carbon (mg/kg)	5270	112	168	1610	NA	NA	NA
	B547-10 07/02/90 2.5-3 ft	B547-6 07/02/90 2.5-3 ft	B547-6 07/02/90 3.5-4 ft	B547-7 06/28/90 2.5-3 ft	B547-8 07/03/90 4-4.5 ft	B547-9 07/02/90 4-4.5 ft	MW547-1 06/29/90 2.5-3 ft
Characteristic Measurements							
pH (Units)	8	8.4	8.7	9.2	8.1	7.5	9.1

Notes: NA = Not Analyzed
 < = Detection Limit
 mg/kg = milligrams per kilogram
 Data not validated by JMM

TABLE 9-9

SITE 7C - BUILDING 547, SERVICE STATION
RESULTS FOR GENERAL CHEMICAL CHARACTERISTICS IN SOIL SAMPLES
 (Sheet 2 of 2)

	B547-9 07/03/90 2.5-3 ft	MW547-1 06/29/90 1-1.5 ft	MW547-2 06/29/90 1.5-2 ft	MW547-3 07/13/90 2-2.5 ft	MW547-4 06/28/90 1-1.5 ft	MW547-5 06/29/90 1-1.5 ft
Parameter Reported						
Miscellaneous Measurements						
Ash (%)	98.6	95.5	94.8	84.9	95.7	93.1
Chloride (mg/kg)	12.2	5.7	10.5	9.9	6	25
Exchangeable Ammonium-N (mg/kg)	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0
Nitrate (as Nitrogen) (mg/kg)	0.93	<0.160	0.73	<0.160	0.7	0.18
Sulfate (mg/kg)	5.8	9	38	7.4	8.4	9.7
Total Kjeldahl Nitrogen (mg/kg)	72.8	56	174	118	84	252
Total Phosphorus (mg/kg)	222	443	1090	359	306	411
Total Organic Carbon						
Total Organic Carbon (mg/kg)	168	243	2000	224	292	682
	MW547-2 06/29/90 2.5-3 ft	MW547-3 07/02/90 4-4.5 ft	MW547-4 06/29/90 2.5-3 ft	MW547-5 06/29/90 2.5-3 ft		
Characteristic Measurements						
pH (Units)	7.2	8.3	8.9	8.4		

Notes: NA = Not Analyzed
 < = Detection Limit
 mg/kg = milligrams per kilogram
 Data not validated by JMM

TABLE 9-10

SITE 7C - BUILDING 547, SERVICE STATION
RESULTS FOR VOLATILE ORGANIC COMPOUNDS DETECTED IN GROUNDWATER SAMPLES

Parameter Reported	201 08/06/90 0-0 ft	202 08/07/90 0-0 ft	MW547-1 08/07/90 0-0 ft	MW547-3 08/07/90 0-0 ft	MW547-4 08/06/90 0-0 ft	MW547-5 08/06/90 0-0 ft
Methylene Chloride (ug/L)	18	18	17	170	190	<50
Benzene (ug/L)	<5.00	<5.00	<5.00	900	550	530
Ethylbenzene (ug/L)	<5.00	<5.00	<5.00	1100	1600	1800
Xylenes (total) (ug/L)	<5.00	<5.00	<5.00	110	<50	<50

Notes: NA = Not Analyzed

< = Detection Limit

ug/L = micrograms per liter

Data not validated by JMM

200-series numbers as well or boring name indicates a travel blank

TABLE 9-11

**SITE 7C - BUILDING 547, SERVICE STATION
RESULTS FOR SEMIVOLATILE ORGANIC COMPOUNDS AND
TOTAL RECOVERABLE PETROLEUM HYDROCARBONS IN GROUNDWATER SAMPLES**

Parameter Reported	MW547-3 08/07/90 0-0 ft	MW547-4 08/06/90 0-0 ft
Semivolatile Compounds		
Phenol (ug/L)	13	4
2,4-Dimethylphenol (ug/L)	<10.0	39
Naphthalene (ug/L)	56	53
2-Methylnaphthalene (ug/L)	9	6
Hydrocarbon Compounds		
TRPH (mg/L)	1.5	0.94

Notes: NA = Not Analyzed
 < = Detection Limit
 ug/L = micrograms per liter
 mg/L = milligrams per liter
 Data not validated by JMM

TABLE 9-12

**SITE 7C - BUILDING 547, SERVICE STATION
RESULTS FOR METALS DETECTED IN GROUNDWATER SAMPLES**

Parameter Reported	MW547-1 08/07/90 0-0 ft	MW547-2 08/08/90 0-0 ft	MW547-3 08/07/90 0-0 ft	MW547-5 08/06/90 0-0 ft	MW547-5A 08/06/90 0-0 ft
Aluminum (mg/L)	200	305	143	137	144
Arsenic (mg/L)	0.086	<0.100	<0.050	0.061	0.054
Barium (mg/L)	1.3	1.9	0.71	0.91	0.76
Beryllium (mg/L)	<0.005	0.0071	<0.005	<0.005	<0.005
Calcium (mg/L)	30	49	24	91	32
Chromium (mg/L)	0.53	0.92	0.37	39	0.41
Cobalt (mg/L)	0.11	0.16	0.057	0.073	0.067
Copper (mg/L)	0.17	0.26	0.1	0.11	0.12
Iron (mg/L)	241	376	152	172	168
Lead (mg/L)	0.082	<0.050	0.056	<0.050	<0.050
Magnesium (mg/L)	57	94	46	83	56
Manganese (mg/L)	3.1	4.9	1.9	4.7	2.1
Nickel (mg/L)	0.73	1.1	0.49	0.54	0.52
Potassium (mg/L)	17	20	16	23	10
Selenium (mg/L)	0.075	0.15	<0.050	<0.059	<0.050
Silver (mg/L)	0.012	<0.010	<0.010	0.017	<0.010
Sodium (mg/L)	214	203	221	246	388
Titanium (mg/L)	4.9	7.7	2.5	3.5	3.1
Vanadium (mg/L)	0.44	0.69	0.28	0.29	0.29
Zinc (mg/L)	0.4	0.68	0.27	0.29	0.31

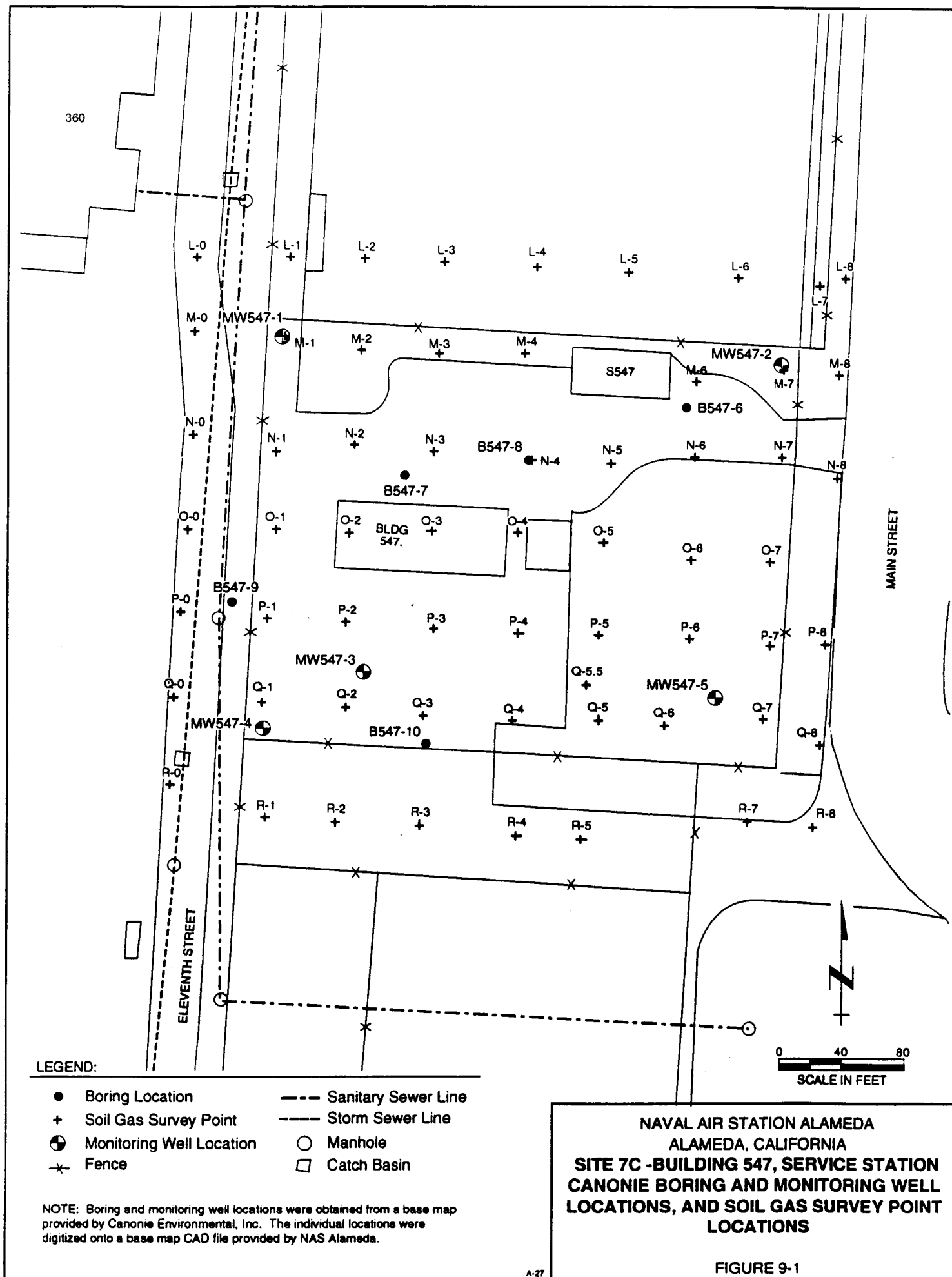
Notes: NA = Not Analyzed
 < = Detection Limit
 mg/L = milligrams per liter
 Data not validated by JMM

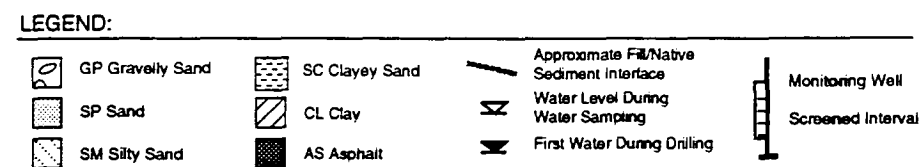
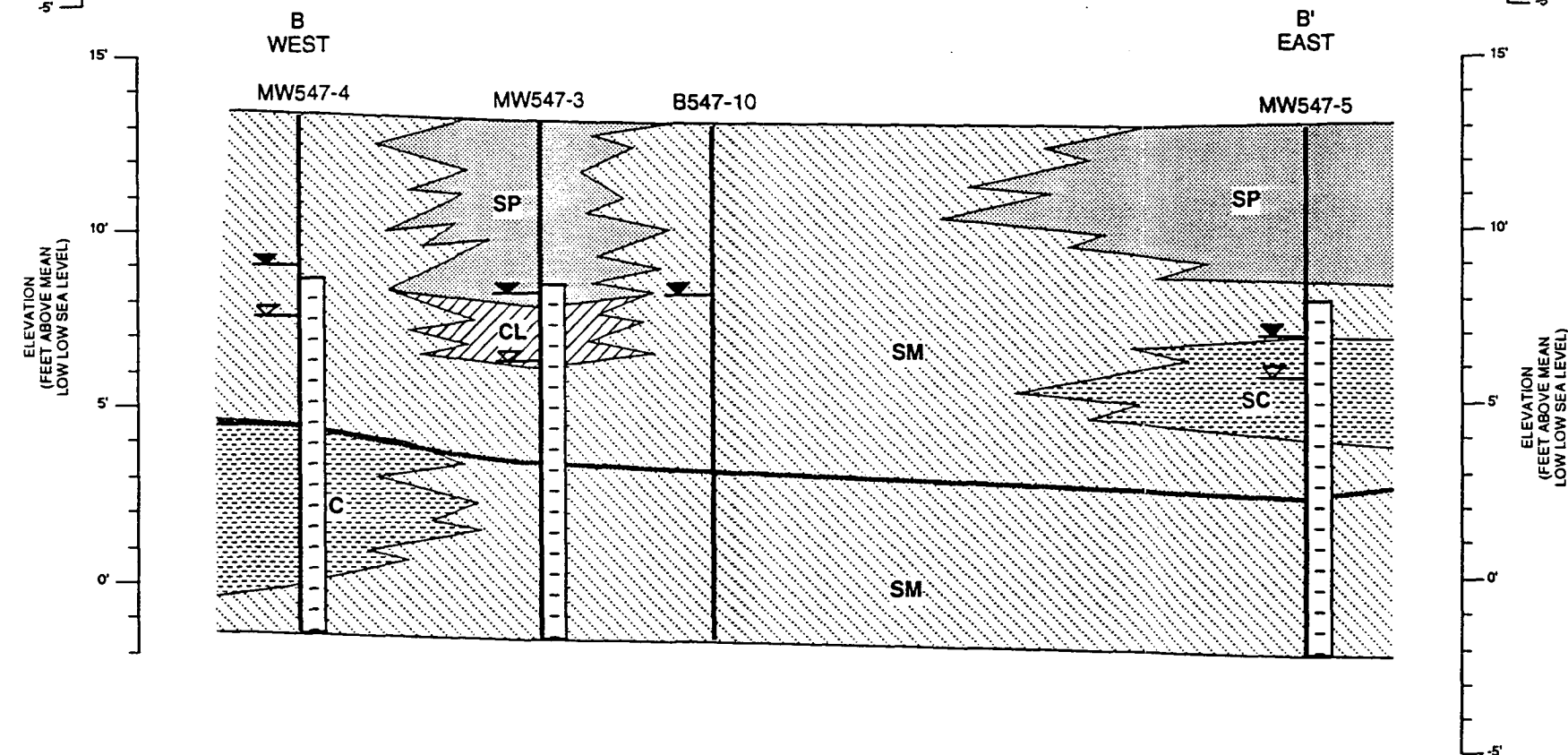
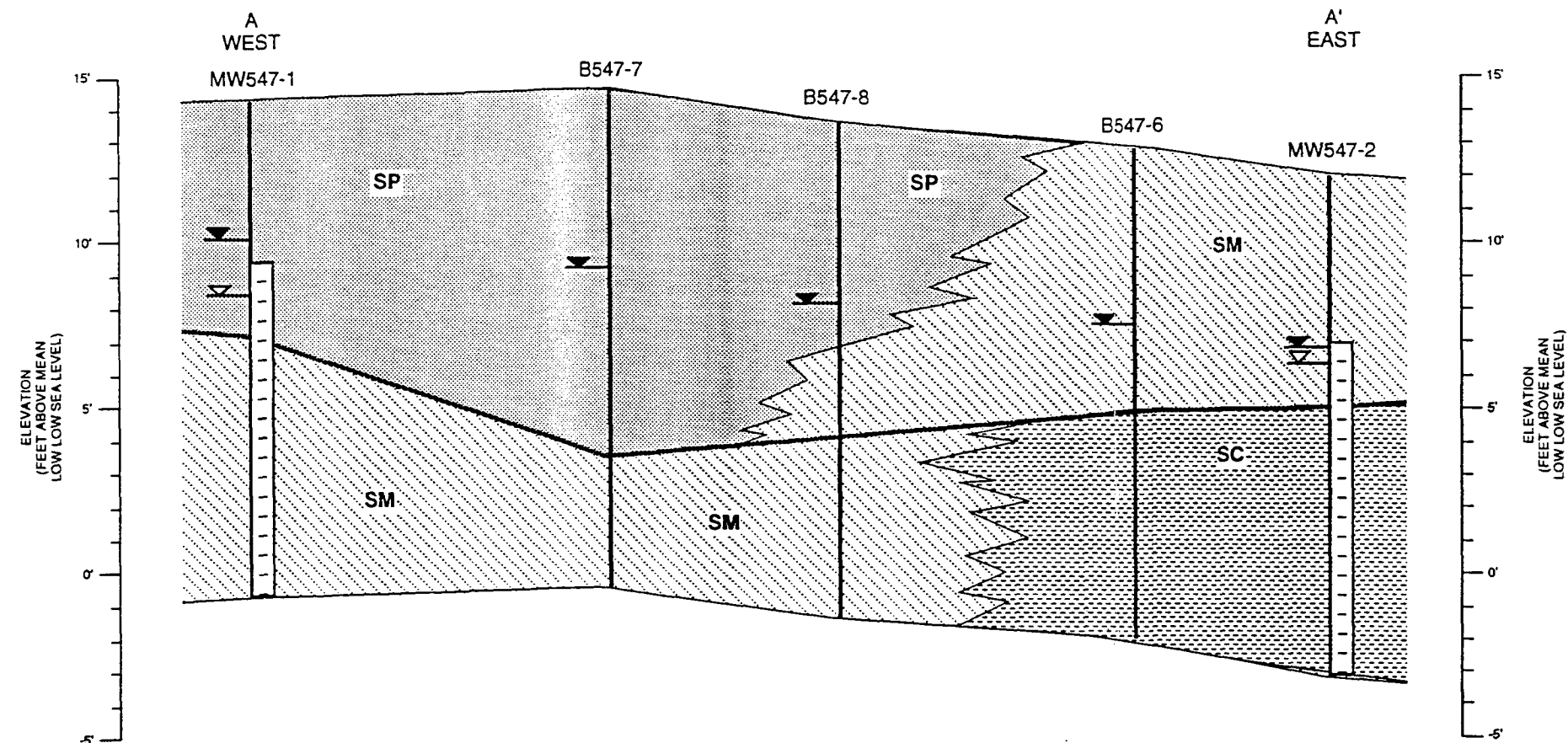
TABLE 9-13

**SITE 7C - BUILDING 547, SERVICE STATION
RESULTS FOR GENERAL CHEMICAL CHARACTERISTICS IN GROUNDWATER SAMPLES**

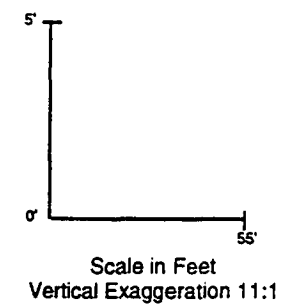
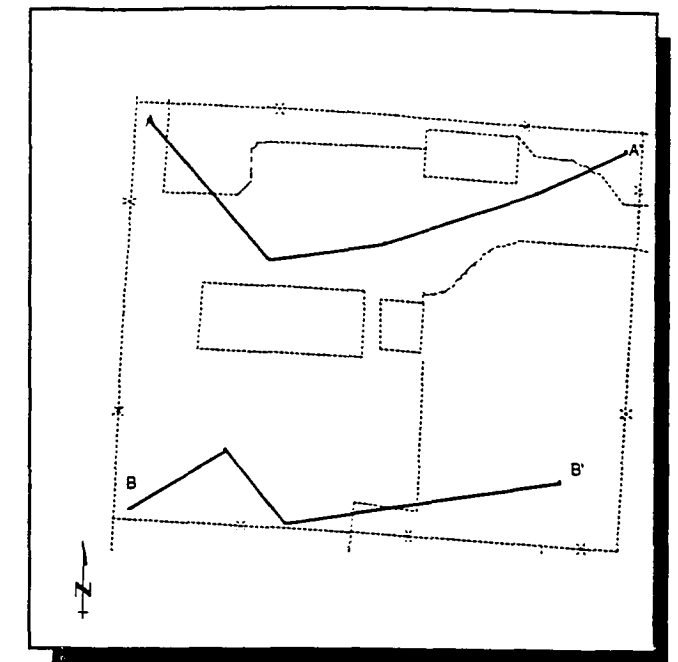
Parameter Reported	MW547-1 08/07/90 0-0 ft	MW547-2 08/08/90 0-0 ft	MW547-3 08/07/90 0-0 ft	MW547-4 08/06/90 0-0 ft	MW547-5 08/06/90 0-0 ft	MW547-5A 08/06/90 0-0 ft
Miscellaneous Measurements						
Total Hardness (as CaCO ₃) (mg/L)	310	509	250	NA	568	310
Total Organic Carbon						
Total Organic Carbon (mg/L)	18.9	37.8	15.6	23.8	21.7	NA
Characteristic Measurements						
Dissolved Oxygen (mg/L)	3.9	3.8	6.2	NA	3.8	NA
pH (Units)	7.4	7.4	7.5	NA	7.2	7.7
Cations/Anions						
Specific Conductivity (umhos)	930	810	980	NA	1130	1260

Notes: NA = Not Analyzed
 < = Detection Limit
 mg/L = milligrams per liter
 umhos = micromhos per centimeter
 Data not validated by JMM



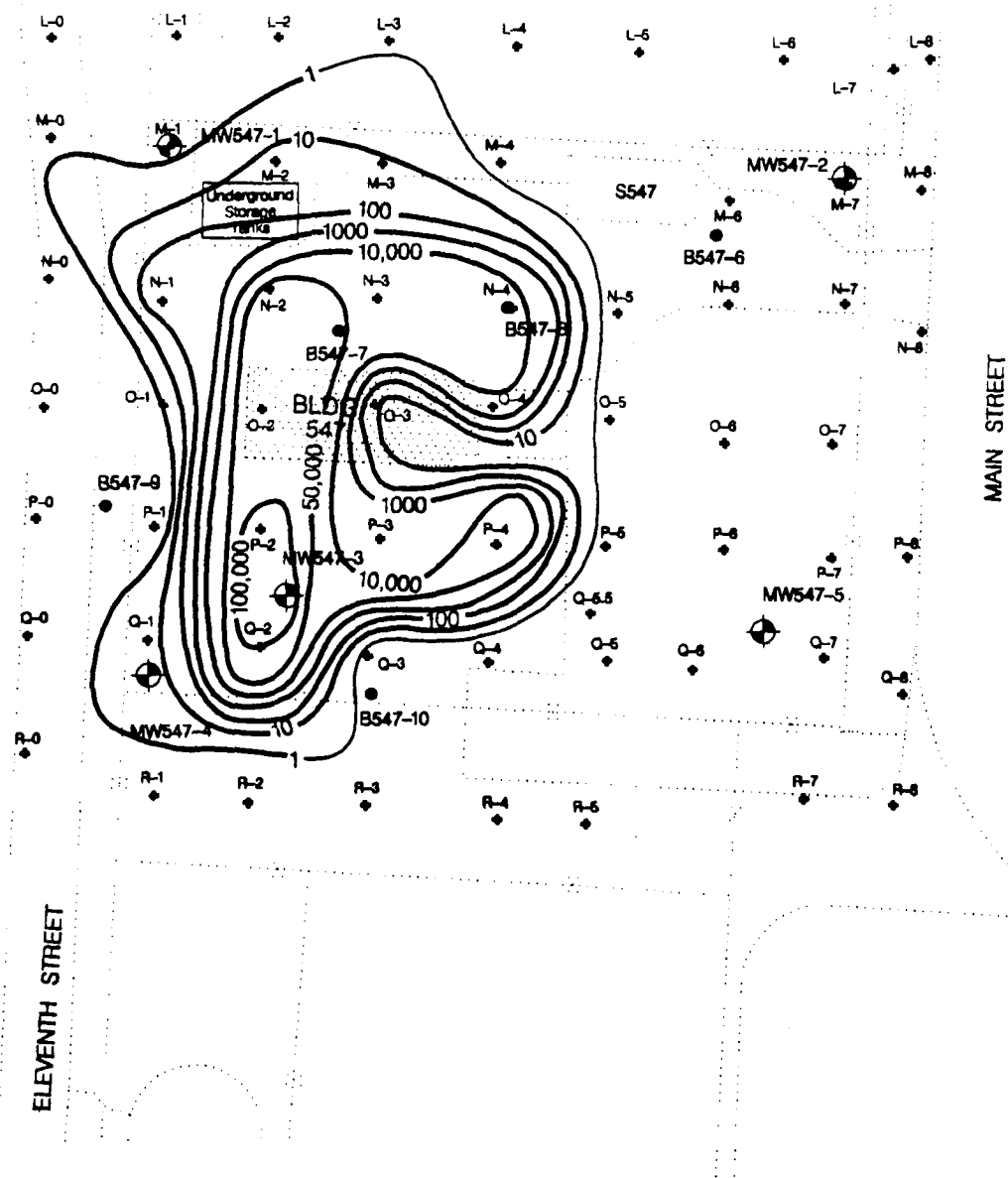


This cross section is based on logs of wells and borings drilled and logged by Canone Environmental, Inc. All water levels were measured by Canone Environmental, Inc.



NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
SITE 7C - BUILDING 547, SERVICE STATION
GEOLOGIC CROSS SECTION A-A', B-B'

FIGURE 9-2

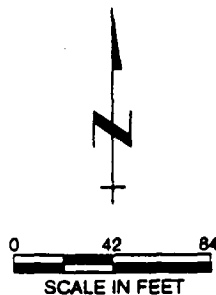


LEGEND:

- Boring Location
- ◆ Soil Gas Survey Point
- ⊕ Monitoring Well Location
- 10 Benzene Concentration (µg/l)

NOTE:

Boring and monitoring well locations were obtained from a base map provided by Canonic Environmental, Inc. The individual locations were digitized onto a base map CAD file provided by NAS Alameda.



NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
SITE 7C - BUILDING 547, SERVICE STATION
BENZENE CONCENTRATIONS FROM
SOIL GAS SURVEY

FIGURE 9-3

360

B547-8 (µg/kg)	Depth (ft)	3.5-4	5-5.5	8-8.5	11-11.5	12.5-13
Methylene Chloride		920	<6600	84	23	14
Acetone		<1300	<13000	690	<12.0	<12.0
1,2-Dichloroethane		<660	<6600	<30.0	14	7
Trichloroethene		<660	<6600	<30.0	11	<6.00
Ethylene Dibromide		1.8	2.4	NA	NA	NA

MW547-1 (µg/kg)	Depth (ft)	2-2.5	4.5-5	8-8.5	11-11.5	14-14.5
Methylene Chloride		7	10	9	9	10
Acetone		6	51	18	17	48
2-Butanone		<10.0	6	<12.0	<12.0	<13.0

MW547-2 (µg/kg)	Depth (ft)	2-2.5	5.5-6	9.5-10	12.5-13	14-14.5
Methylene Chloride		<13.0	9	9	8	4
Acetone		<26.0	20	11	<12.0	20
Trichloroethene		4	<6.00	<6.00	<6.00	<6.00

B547-7 (µg/kg)	Depth (ft)	8-8.5	11-11.5	14-14.5
Methylene Chloride		6	<30.0	7
Acetone		18	<61	34
2-Butanone		12	19	12

B547-8

B547-6 (µg/kg)	Depth (ft)	4.5-5	6-6.5	9-9.5	11-11.5	14-14.5
Methylene Chloride		20	22	21	8	17
Acetone		21	27	<12.0	<12.0	<12.0

B547-9 (µg/kg)	Depth (ft)	3.5-4	5-5.5	8-8.5	14-14.5
Methylene Chloride		19	26	24	30
Acetone		<12.0	18	<12.0	<12.0

B547-7

BLDG
547.

MW547-3 (µg/kg)	Depth (ft)	3.5-4	5-5.5	8-8.5	10.5-11	14-14.5
Methylene Chloride		54000	24	31	59	26
Acetone		<14000	19	41	<12.0	<12.0
4-Methyl-2-pentanone		72000	<6.20	<5.90	<6.10	<6.00

B547-9

MW547-3

MW547-5

MW547-4

B547-10

MW547-4 (µg/kg)	Depth (ft)	2-2.5	5-5.5	8-8.5	10.5-11	14-14.5
Methylene Chloride		4	<10.0	4	5	4
Acetone		8	<19.0	7	3	7
2-Butanone		<10.0	7	<12.0	<13.0	<12.0
Trichloroethene		<5.00	<10.0	2	2	<6.00

MW547-5 (µg/kg)	Depth (ft)	2-2.5	5-5.5	8-8.5	11-11.5	14-14.5
Methylene Chloride		<9.00	5	4	4	4
Acetone		<17.0	11	12	7	9
2-Butanone		<17.0	<13.0	3	<12.0	<12.0
Trichloroethene		2	<7.00	<6.00	<6.00	<6.00

B547-10 (µg/kg)	Depth (ft)	2-2.5	5-5.5	8-8.5	11-11.5	14-14.5
Methylene Chloride		22	25	18	24	19
Acetone		<11.0	52	13	<12.0	<12.0

ELEVENTH STREET

LEGEND:

- Canone Boring Location
- ⊕ Canone Monitoring Well Location
- ✱ Fence
- Sanitary Sewer Line
- Storm Sewer Line
- Manhole
- Catch Basin

NOTES:

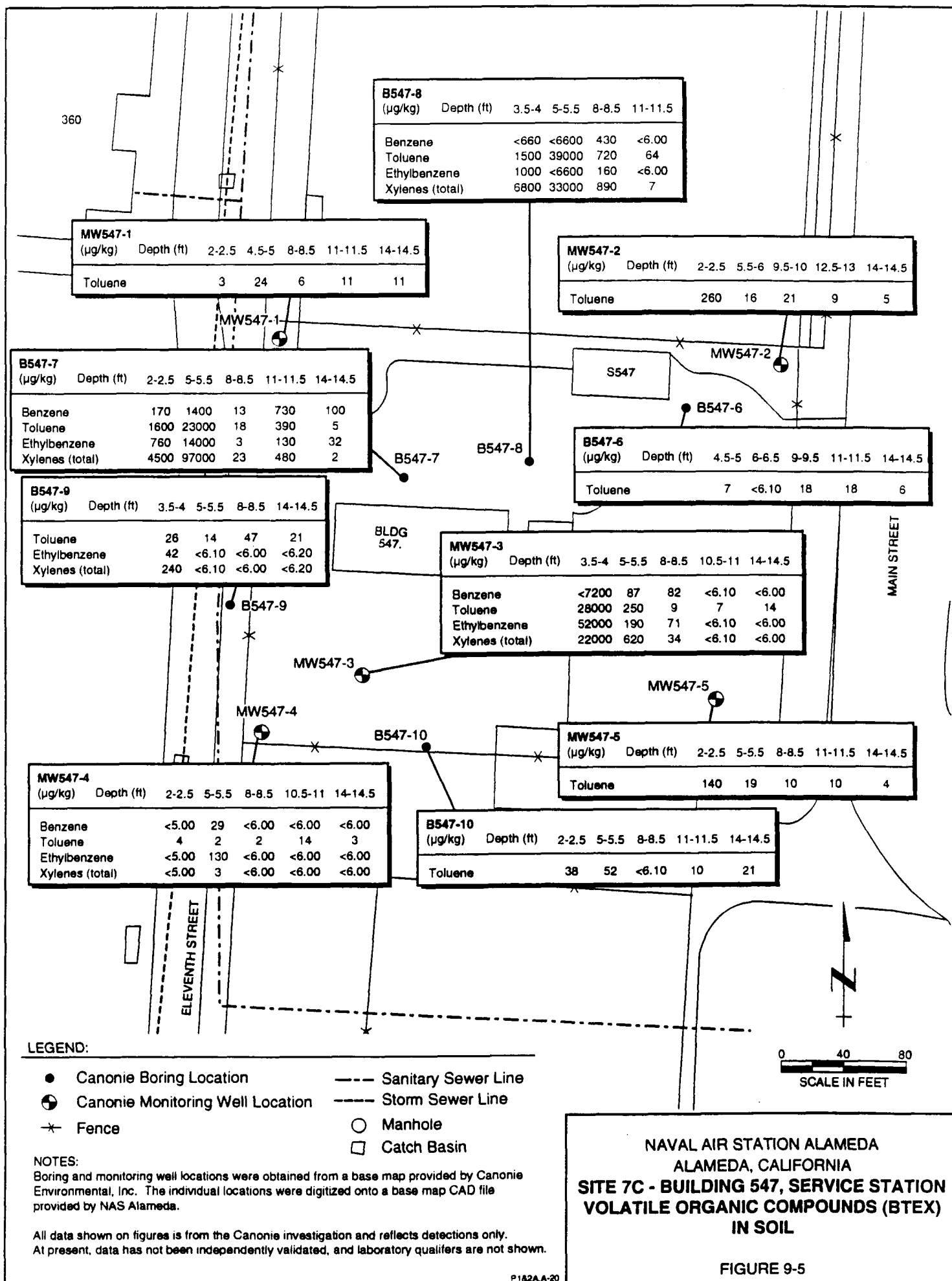
Boring and monitoring well locations were obtained from a base map provided by Canone Environmental, Inc. The individual locations were digitized onto a base map CAD file provided by NAS Alameda.

All data shown on figures is from the Canone investigation and reflects detections only. At present, data has not been independently validated, and laboratory qualifiers are not shown.

0 40 80
SCALE IN FEET

NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
**SITE 7C - BUILDING 547, SERVICE STATION
ETHYLENE DIBROMIDE AND VOLATILE
ORGANIC COMPOUNDS
(EXCLUDING BTEX) IN SOIL**

FIGURE 9-4



MW547-2 (µg/kg)	Depth (ft)	0.5-1
Fluoranthene		76
Pyrene		93
Benzo(a)anthracene		61
Chrysene		58
Phenanthrene		57

B547-8 (µg/kg)	Depth (ft)	3.5-4	5-5.5
Naphthalene		2000	<700
2-Methylnaphthalene		4400	1500

B547-7 (µg/kg)	Depth (ft)	2-2.5	5-5.5	8-8.5
Fluoranthene		140	220	<390
Pyrene		110	190	<390
Benzo(a)anthracene		56	100	<390
Chrysene		<380	88	<390
Phenol		<380	300	100
Naphthalene		2900	9800	<390
2-Methylnaphthalene		4100	9400	<390
Acenaphthene		46	120	<390
Fluorene		46	130	<390
Phenanthrene		180	410	<390
Anthracene		50	96	<390

MW547-3 (µg/kg)	Depth (ft)	3.5-4
Naphthalene		16000
2-Methylnaphthalene		16000

MW547-5 (µg/kg)	Depth (ft)	5-5.5
Fluoranthene		300
Pyrene		340
Benzo(a)anthracene		88
Chrysene		140
Benzo(b)fluoranthene		94
Benzo(k)fluoranthene		120
Benzo(a)pyrene		140
Indeno(1,2,3-cd)pyrene		140
Benzo(g,h,i)perylene		160

MW547-4 (µg/kg)	Depth (ft)	5.5-6
Naphthalene		100

LEGEND:

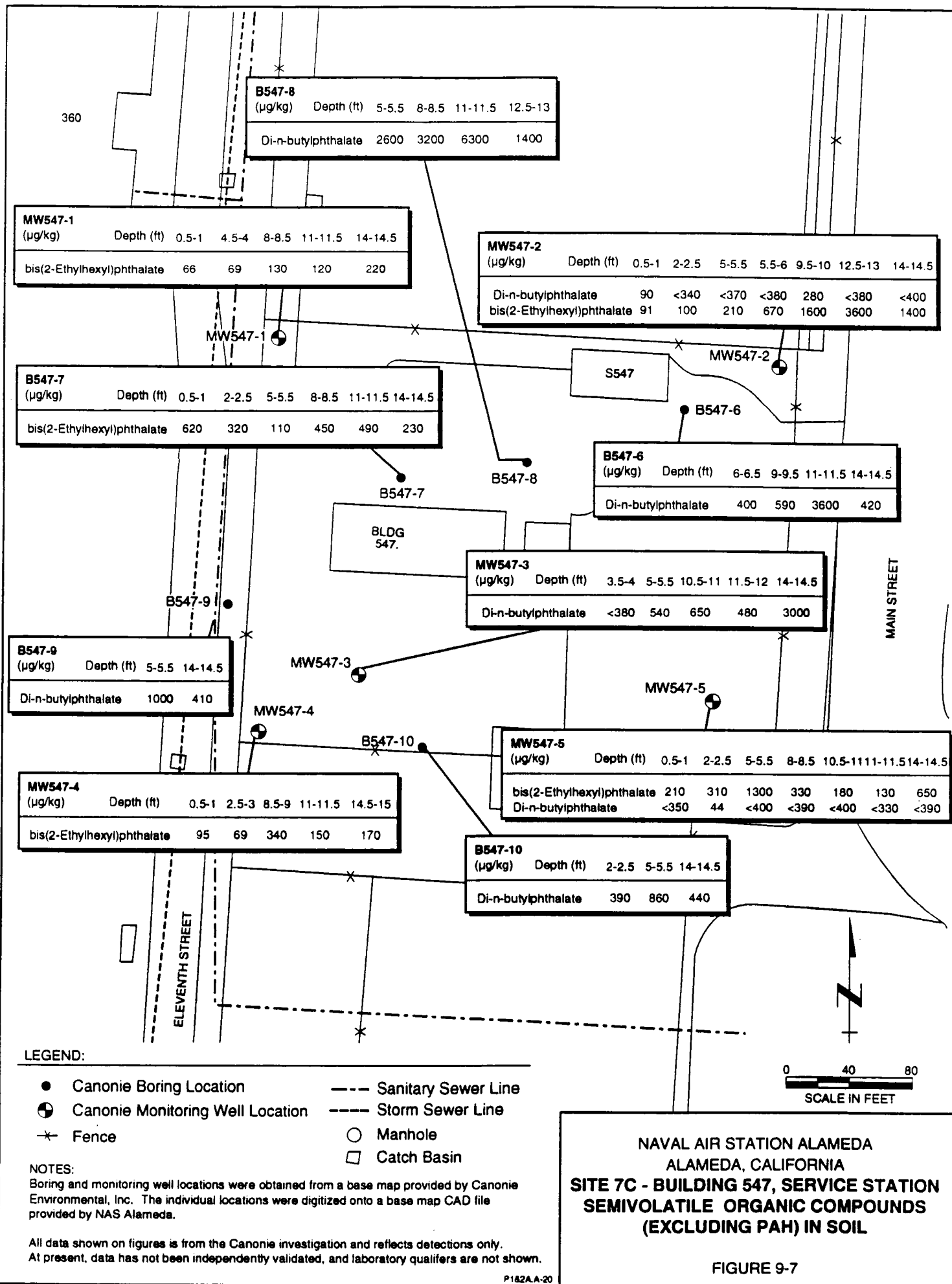
- Canonie Boring Location
- ⊕ Canonie Monitoring Well Location
- ✱ Fence
- Sanitary Sewer Line
- Storm Sewer Line
- Manhole
- Catch Basin

NOTES:
Boring and monitoring well locations were obtained from a base map provided by Canonie Environmental, Inc. The individual locations were digitized onto a base map CAD file provided by NAS Alameda.

All data shown on figures is from the Canonie investigation and reflects detections only. At present, data has not been independently validated, and laboratory qualifiers are not shown.

NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
**SITE 7C - BUILDING 547, SERVICE STATION
SEMIVOLATILE ORGANIC COMPOUNDS
(PAH) IN SOIL**

FIGURE 9-6



360

MW547-1	Depth (ft)	0.5-1	1-1.5
TRPH (mg/kg)		308	
Total Organic Carbon (mg/kg)			243

B547-8	Depth (ft)	4-4.5	5.5-6
TRPH (mg/kg)		199	429

MW547-2	Depth (ft)	0.5-1	1.5-2	2.5-3
TRPH (mg/kg)		30.4		4
Total Organic Carbon (mg/kg)			2000	

B547-7	Depth (ft)	0.5-1	1-1.5	2.5-3	5.5-6
TRPH (mg/kg)		4.8		31.2	10800
Total Organic Carbon (mg/kg)			1610		

B547-9	Depth (ft)	2.5-3
TRPH (mg/kg)		255
Total Organic Carbon (mg/kg)		168

B547-6	Depth (ft)	2.5-3	3.5-4
TRPH (mg/kg)		98.6	172
Total Organic Carbon (mg/kg)		112	168

MW547-3	Depth (ft)	2-2.5	4-4.5	5.5-6
TRPH (mg/kg)		4.7	45.3	119
Total Organic Carbon (mg/kg)			224	

MW547-5	Depth (ft)	0.5-1	1-1.5	2.5-3	5.5-6	8.5-9
TRPH (mg/kg)		35.8		3.8	99.7	6.5
Total Organic Carbon (mg/kg)			683			

B547-4	Depth (ft)	1-1.5
Total Organic Carbon (mg/kg)		292

B547-10	Depth (ft)	1-1.5	2.5-3	5.5-6
TRPH (mg/kg)		4.7	2.8	24.4
Total Organic Carbon (mg/kg)			5270	

MAIN STREET

ELEVENTH STREET

LEGEND:

- Canonie Boring Location
- ⊕ Canonie Monitoring Well Location
- * Fence
- Sanitary Sewer Line
- Storm Sewer Line
- Manhole
- Catch Basin

NOTES:

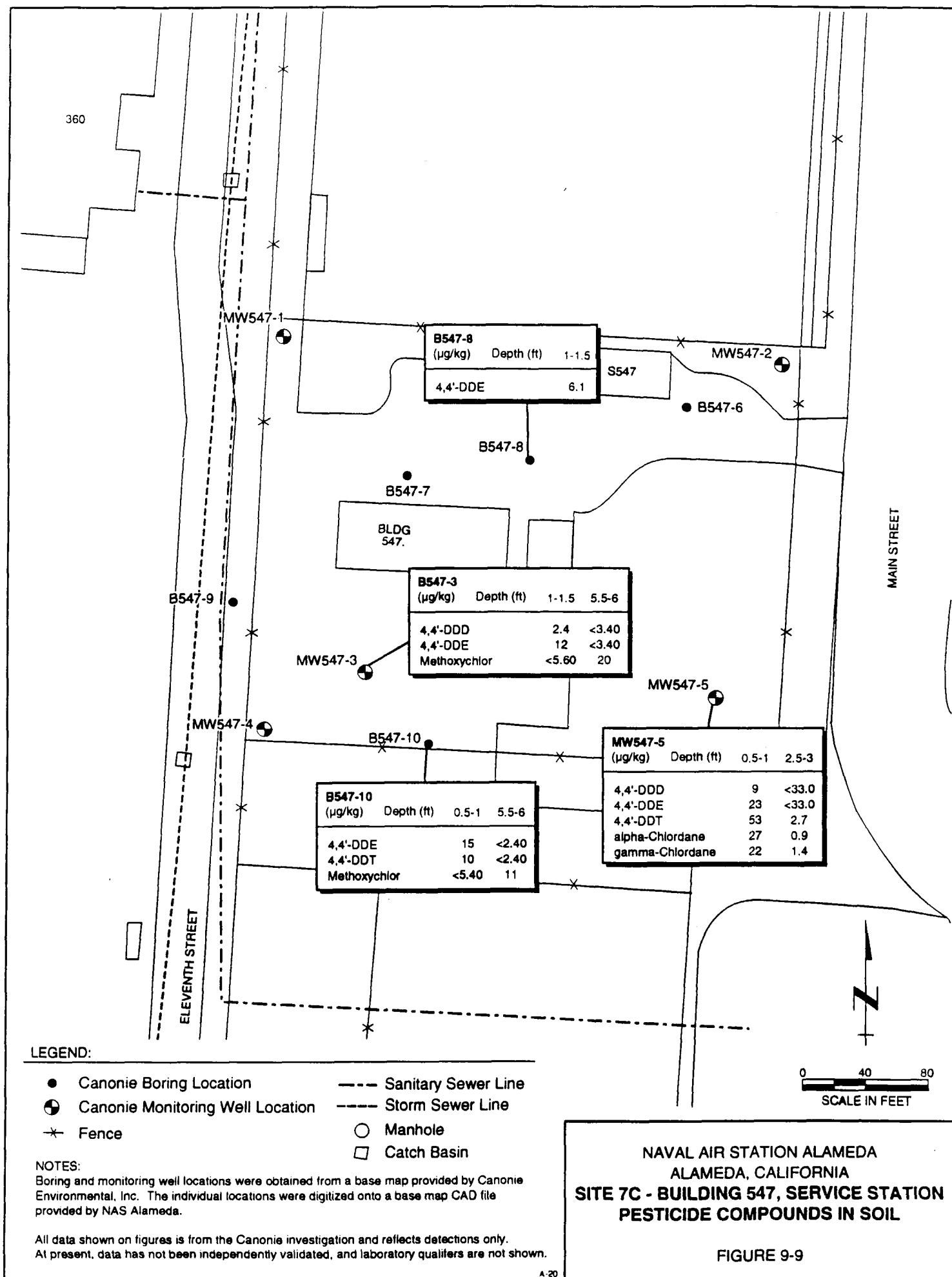
Boring and monitoring well locations were obtained from a base map provided by Canonie Environmental, Inc. The individual locations were digitized onto a base map CAD file provided by NAS Alameda.

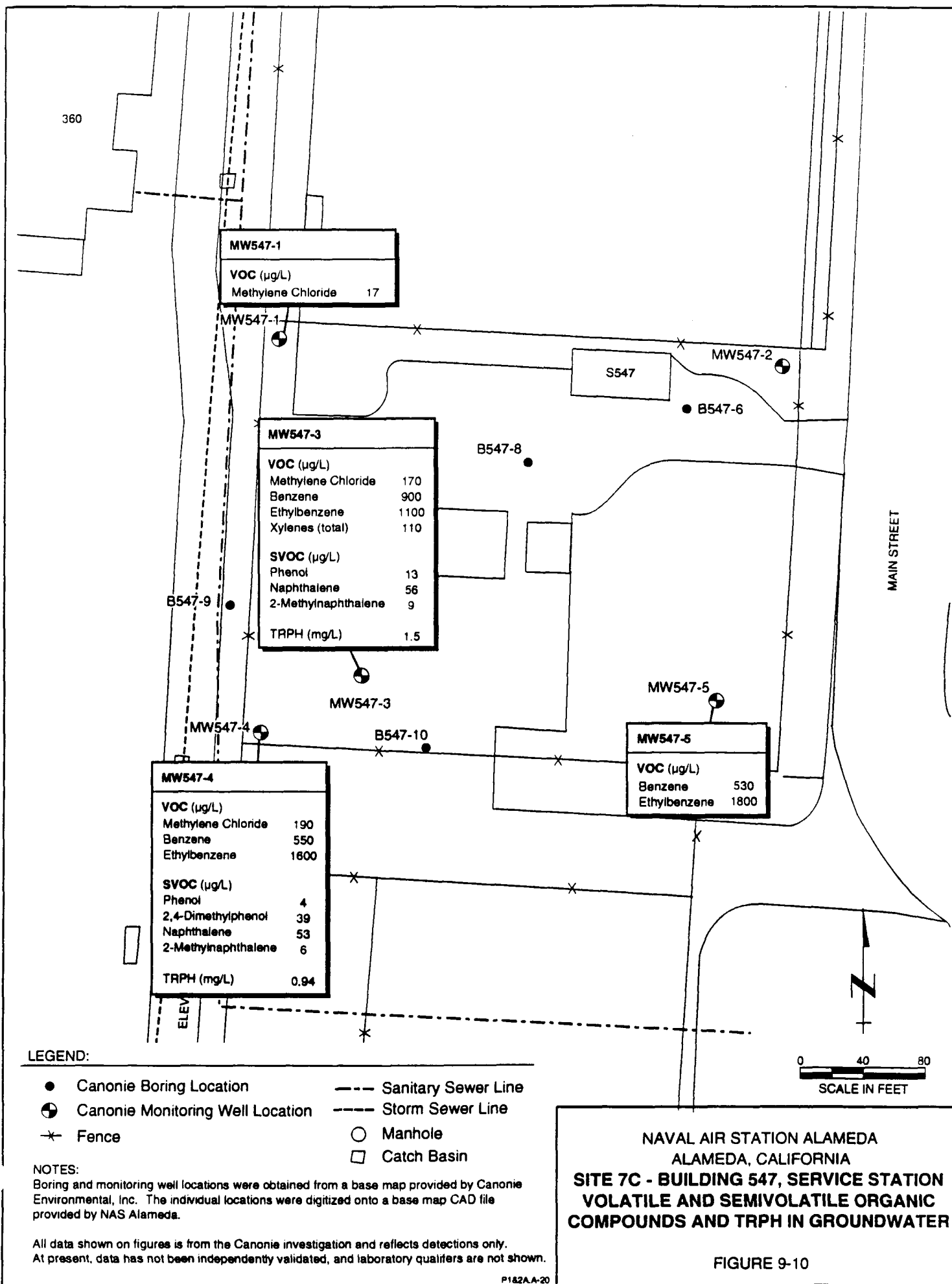
All data shown on figures is from the Canonie investigation and reflects detections only. At present, data has not been independently validated, and laboratory qualifiers are not shown.

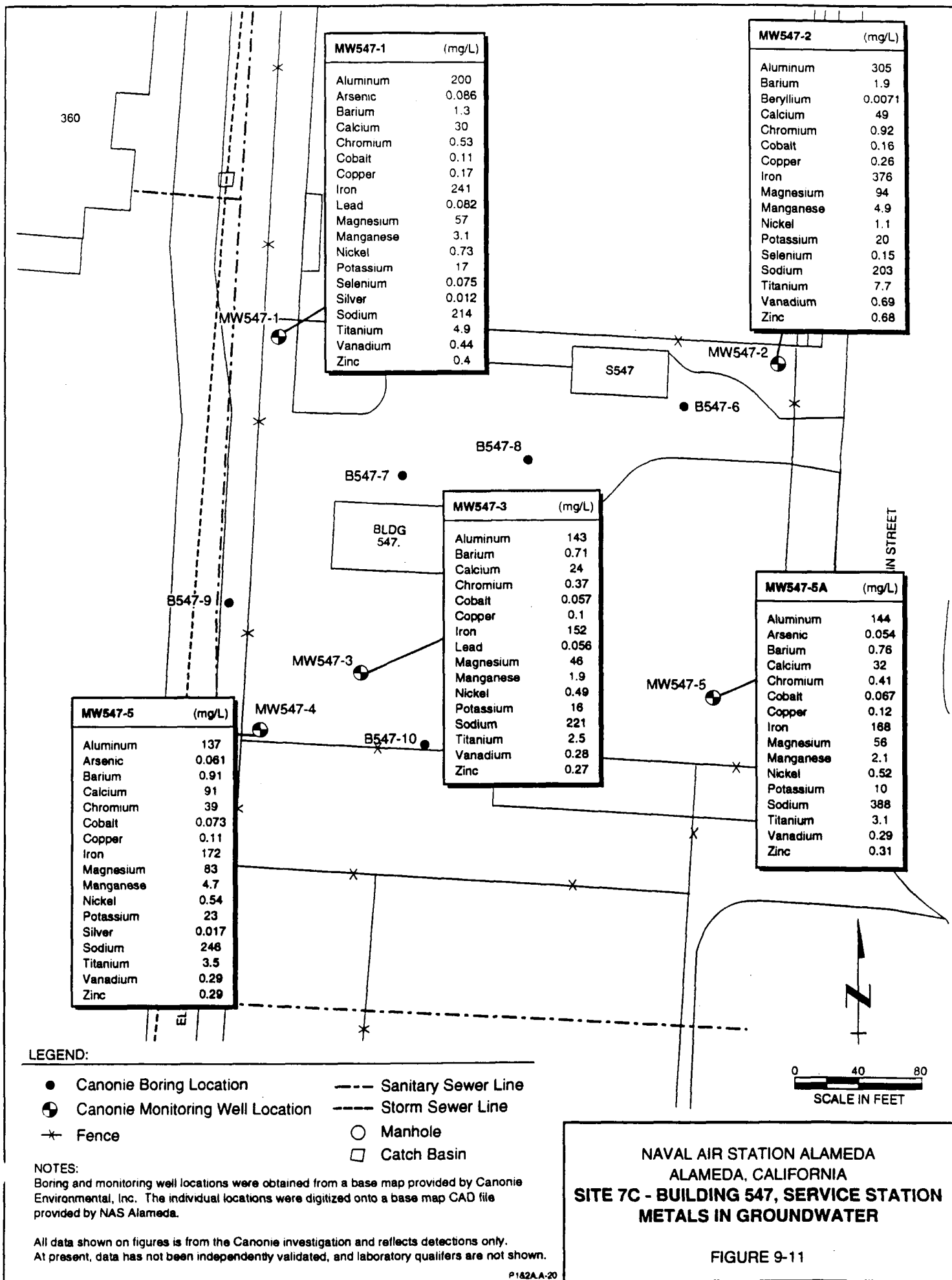
0 40 80
SCALE IN FEET

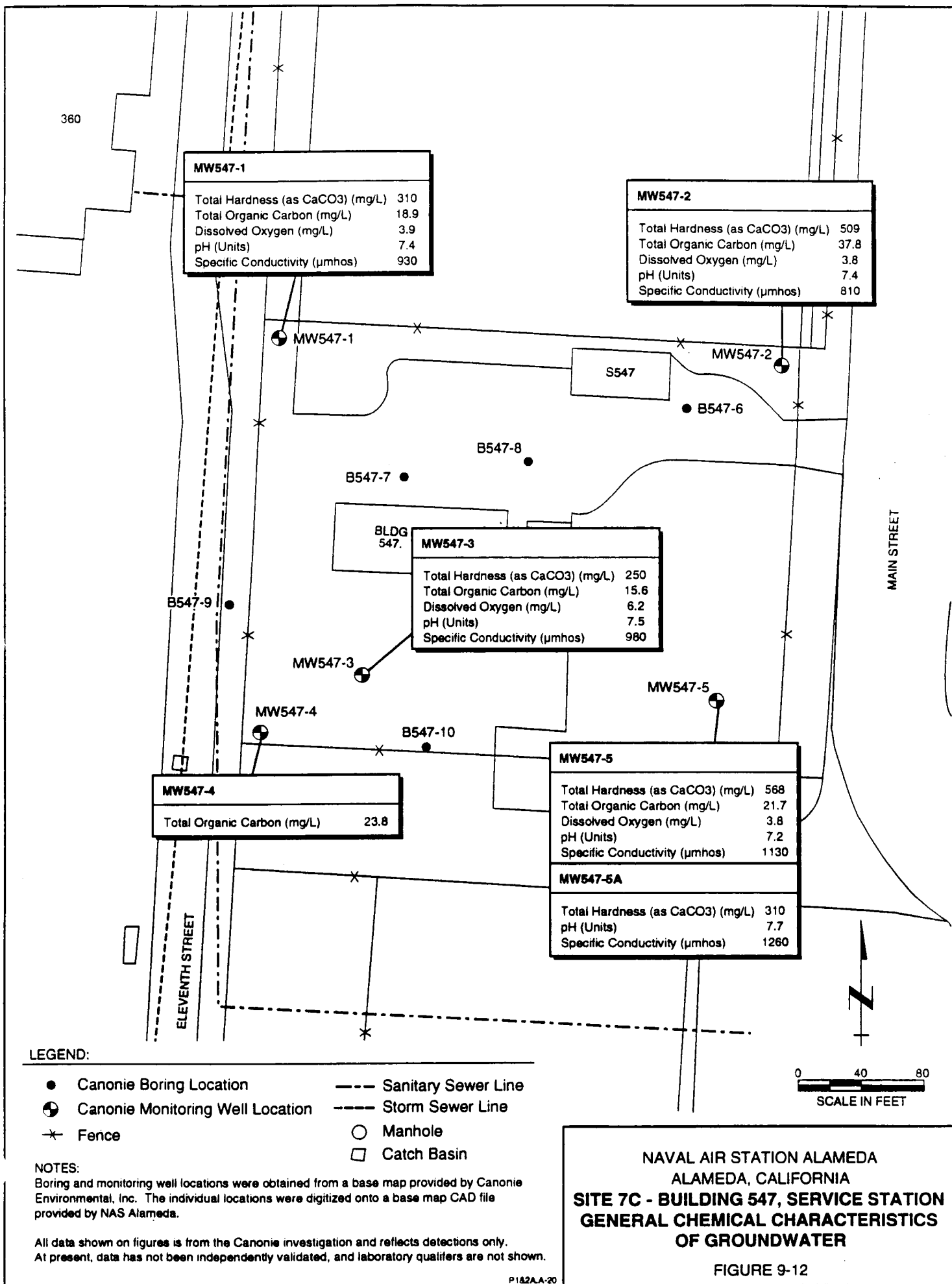
NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
SITE 7C - BUILDING 547, SERVICE STATION
TRPH AND TOTAL ORGANIC CARBON
IN SOIL

FIGURE 9-8









10.0 SITE 9 - BUILDING 410, PAINT STRIPPING

10.1 SITE DESCRIPTION AND BACKGROUND

Site 9 is located about 850 feet west of the south gate on Eighth Street between Avenues L and M (Figure 1-2). The site, approximately 1 acre in size, consists of Building 410 and the area to the east. Building 410 formerly housed the aircraft paint stripping operation for NAS Alameda and is located on Eighth Street between Avenues L and M. Wastewater from the paint stripping operation contained oil, paint, paint skins, detergent, and paint stripper (E&E, 1983). Prior to the construction of the Building 410 Industrial Waste Treatment Facility in 1973, wastewater from Building 410 was discharged directly to the industrial wastewater collection system without treatment (E&E, 1983).

10.2 CURRENT USE

According to NAS Alameda personnel, Building 410 is no longer in use. However, at the time of the Canonie investigation in 1990, Building 410 was still operating as an aircraft paint stripping facility (Canonie, 1990c).

10.3 PREVIOUS INVESTIGATIONS

As part of the Naval Air Rework Facility (NARF) Industrial Waste Survey in 1981, composite samples were taken from Building 410 wastewater. The Initial Assessment Study (E&E, 1983) presented analytical data from the 1981 NARF survey, which indicated high concentrations of chromium, phenol, surfactants, and total solids, as well as high biologic oxygen demand (BOD) and chemical oxygen demand (COD) in the wastewater. The composite analyses performed on the wastewater discharges from Building 410 as part of the NARF survey also identified cadmium, zinc, pH, suspended solids, oil and grease, methylene chloride, chloroform, and TCA.

10.4 REMEDIAL INVESTIGATION

The focus of the field investigation conducted by Canonie at Building 410 was to determine whether chemicals from surface spills or leaks in the subsurface sewer system have impacted soils and groundwater at the site. Field notes from Canonie did not indicate any visual evidence of surface spills. Nine soil borings were drilled at this site; monitoring wells were installed in four of the nine borings, one on each side of Building 410. The locations of the borings and monitoring wells are presented on Figure 10-1. Boring logs and

construction details are presented in Appendix C. Both soil and groundwater samples were collected from Site 9. Table 10-1 provides a complete list of analyses, by sample, conducted at Site 9.

10.4.1 Site Geology/Hydrogeology

Lithologic logs prepared by Canonie from the installation of monitoring wells and from soil borings drilled at Site 9 indicate that the site is underlain by fill material, comprised of predominantly light brown silty fine sand, to a depth of 9 to 15 feet. In four of the borings, Bay Mud deposits consisting of dark grey to black fine, silty sand to dark grey, clayey sand to dark grey to black silty clay were encountered beneath the artificial fill. No native sediments were encountered in the remaining five borings. Cross sections showing the subsurface stratigraphy based on the Canonie boring logs are presented on Figure 10-2, and boring logs and well construction details are provided in Appendix C. Table 10-2 provides the laboratory results of the geotechnical analyses; results are provided in Appendix D. Hydraulic conductivity was measured as 5.00×10^4 cm/s from the 10-foot sample from boring B410-7.

Groundwater was encountered between 5.5 and 7.0 feet bgs during drilling. Groundwater measurements taken by Canonie on November 8, 1990 range between 6.34 and 7.94 feet bgs with a local gradient of about 0.001 foot/foot to the west. November 8, 1990 groundwater contours are shown on Figure 2-4. Groundwater samples collected from the four groundwater monitoring wells (MW410-1 through MW410-4) contained TDS ranging from 320 to 990 mg/L.

10.4.2 Analytical Results - Soil Samples

Soil samples for Site 9 were collected during the drilling of five soil borings and four monitoring wells. At each boring, samples were collected at 1.0- to 1.5-foot intervals for a total of 113 soil samples, one of which was a replicate sample. Surface and subsurface soil samples were selectively analyzed for VOCs, SVOCs, metals, and general chemical constituents and parameters. Additionally, subsurface samples were analyzed for VOCs. Table 10-1 provides a summary of analyses by sample. The analytical results are summarized in Tables 10-3 through 10-6 and on Figures 10-3 and 10-4. The figures and tables show only compounds that were detected.

10.4.2.1 Volatile Organic Compounds. Analytical results for VOCs detected in Site 9 soils are summarized in Table 10-3 and Figure 10-3. Low levels of VOCs were detected in 45 of 45 total soil samples. The VOCs detected in the soils at Site 9 are methylene chloride, acetone, carbon disulfide, 1,1-DCA, 1,2-DCE (total), 1,2-DCA, 2-butanone, TCE, toluene, ethylbenzene, and xylenes. Methylene chloride, acetone, and

toluene were the most prevalent. Methylene chloride and acetone, which are commonly seen as laboratory contaminants, were detected in all but one sample. Toluene was detected in all but two samples, and 2-butanone was detected in at least one sample from six of the nine borings. 2-Butanone was reported in some of the laboratory blanks and is therefore a suspect laboratory contaminant. Only one boring, B410-8, contained BTEX. None of the soil samples contained total VOC concentrations above 1 mg/kg.

10.4.2.2 Semivolatile Organic Compounds. The analytical results for SVOCs in soils at Site 9 are summarized in Table 10-4 and on Figure 10-4. SVOCs were detected in 43 of 57 soil samples analyzed for SVOCs at Site 9. SVOCs detected at Site 9 consist of the polycyclic aromatic hydrocarbons (PAH) compounds naphthalene, 2-methylnaphthalene, acenaphthylene, fluorene, phenanthrene, anthracene, fluoranthene, pyrene, indeno(1,2,3-cd)pyrene, dibenz(a,h)-anthracene, and benzo(g,h,i)perylene. PAH compounds were detected in 20 of the 43 samples and were typically most abundant from 11.5 to 15.0 feet bgs. The other SVOCs detected are phenol, 4-chloro-3-methyl phenol, diethylphthalate, n-nitro-di-phenylamine, pentachlorophenol, di-n-butylphthalate, and bis(2-ethylhexyl)phthalate. These compounds were detected in all but five of the forty-three samples. There is no vertical pattern of SVOCs apparent in the soil samples. Only one soil sample collected at the 14.5 foot depth from boring B410-7 contained total SVOC concentrations above 10 mg/kg.

10.4.2.3 Metals. Analytical results for metals in Site 9 soils are summarized in Table 10-5. Background ranges of metals in soil have been estimated for NAS Alameda based on a study conducted by the PRC team under CTO 121 Mod. 0001. Results of this study are included in the background data summary report (PRC/JMM, 1992c). The estimated background ranges of metals in soil are given in Table 3-1. Based on these background data, 17 metals were detected above the 95 percent/95 percent statistical tolerance interval of background concentrations at NAS Alameda. However, as is discussed in the following paragraph, all but magnesium are within normal or extreme concentrations found in typical soils.

Typical concentration ranges of metals occurring naturally in soil are given in Table 3-2. Based on these ranges, only magnesium exceeded the typical range naturally found in soil. The highest concentrations of magnesium were detected in samples from between 9 and 13 feet in borings B410-5, B410-7, and MW410-1. No extreme upper limit is given for magnesium.

10.4.2.4 General Chemical Characteristics. Analytical results for general chemical parameters are summarized in Table 10-6 and TOC is shown on Figure 10-3. Nine samples from selected depths were analyzed for cation exchange capacity, soil pH, and TOC.

10.4.3 Analytical Results - Groundwater Samples

Groundwater samples were collected from four monitoring wells installed at Site 9. Groundwater samples were selectively analyzed for VOCs, SVOCs, metals, and general chemical characteristics. Additionally, four travel blank samples were analyzed for VOCs. Table 10-1 provides a summary of analyses by sample. Tables 10-7 through 10-9 and Figures 10-5 and 10-6 summarize the analytical results for groundwater at Site 9. The travel blank samples are identified on the tables by a 200-series number. The figures and tables show only analytes that were detected.

10.4.3.1 Volatile Organic Compounds. Analytical results for VOCs in groundwater are summarized in Table 10-7 and on Figure 10-5. Methylene chloride is the only VOC detected in the four groundwater samples collected from Site 9. Methylene chloride was detected from all four monitoring wells and in three of four travel blank samples. Therefore, methylene chloride found in the groundwater samples is likely due to laboratory or equipment contamination.

10.4.3.2 Semivolatile Organic Compounds. SVOCs were not detected in the groundwater samples from Site 9.

10.4.3.3 Metals. Analytical results for metals in groundwater are summarized in Table 10-8 and on Figure 10-5. Four groundwater samples from Site 9 were analyzed for metals. According to the Canonie QAPP and QA/QC Plan, groundwater samples for metals were field filtered as appropriate with a 0.45 micron filter (Canonie, 1990b). Background ranges of metals in groundwater have been estimated for NAS Alameda based on a study conducted by the PRC team as CTO 121 Mod. 0001. Results of this study are included in the background data summary report (PRC/JMM, 1992c). The estimated background ranges of metals in groundwater are given in Table 3-3 and discussed in Section 3. Based on these background data, 12 metals were detected with elevated concentrations; however, barium, manganese, and potassium, which had concentrations at Site 9 that exceeded typical levels, were within background ranges (95 percent/95 percent statistical tolerance levels) estimated for NAS Alameda.

Typical concentration ranges of metals occurring naturally in groundwater are given in Table 3-4. Based on these ranges, groundwater samples from all three wells exceeded the typical ranges for most of the following metals: aluminum, arsenic, barium, chromium, cobalt, copper, iron, manganese, nickel, potassium, selenium, silver, titanium, and vanadium. For those elements with extreme limits provided, only vanadium was exceeded in all three wells, and arsenic, iron, manganese, and potassium were well within their extreme limits.

For cobalt, selenium, and silver, the detection limit was higher for some samples than the typical limit of those metals occurring naturally in groundwater.

10.4.3.4 General Chemical Characteristics. General chemical analyses performed on the groundwater samples from Site 9 include specific conductivity, dissolved oxygen, pH, TOC, alkalinity (bicarbonate, carbonate, and total [all as CaCO_3]), chloride, foaming agents, sulfate, TDS, and total hardness (as CaCO_3). Results of the general chemical analyses are presented in Table 10-9 and on Figure 10-6.

10.5 SUMMARY AND CONCLUSIONS

The purpose of the data summary report is to provide a qualitative assessment of the Canonie data to identify whether sufficient information has been collected for the RI/FS evaluation. As discussed in Section 3, QA/QC information is not available for the data validation; therefore, the data presented in this report has not been validated under EPA CLP procedures.

10.5.1 Soils

A total of 113 surface and subsurface samples were collected by Canonie from five soil borings and during the drilling of four monitoring wells at Site 9. Boring logs indicate that artificial fill underlies the site and the Holocene Bay Mud Unit underlies the fill at four of the borings. Site 9 soils were analyzed for VOCs, SVOCs, metals, TOC, and general chemical characteristics; VOCs and SVOCs were detected.

Low levels of VOCs were detected in soil samples collected from various depths in all of the nine borings. Low levels of methylene chloride and acetone were detected in all borings. Of the remaining VOCs detected, toluene was the most prevalent. Concentrations of toluene were relatively high in B410-7 (730 $\mu\text{g/kg}$ at 2.5 feet) compared to the other detections at the site. However, the concentrations of toluene in B410-7 decreased with depth and four surrounding borings and four additional borings at the site all had concentrations detected at less than 100 $\mu\text{g/kg}$. Boring B410-8 was the only boring in which PCE, ethylbenzene, xylenes, 1,1-DCA, and total 1,2-DCE were detected. No soil sample collected at the site contained total VOC concentrations above 1 mg/kg .

SVOCs, consisting of phthalates and PAH, were detected in 53 of 57 soil samples analyzed for SVOCs. Acenaphthene, n-nitroso-di-phenylamine, pentachlorophenol, pyrene, and bis(2-ethylhexyl)phthalate were all reported to have been detected in laboratory blanks; these compounds may be laboratory contaminants. Most of the PAH were detected in soil samples collected at depths between 11.5 and 15.0 feet bgs. PAH was

detected at 2 feet bgs in boring MW410-1, and in boring B410-7 at 5.5, 8.5 feet, and at 14.5 feet bgs. Only one soil sample collected at the 14.5-foot depth from B410-7 contained total SVOC concentrations above 10 mg/kg. In general, however, no apparent lateral and vertical patterns of VOCs were observed from the soil samples collected from this site.

Seventeen metals are present in the soil samples at concentrations exceeding the 95 percent/95 percent statistical tolerance interval of background concentrations at NAS Alameda (PRC/JMM, 1992c). However, all metals analyzed were within the range of concentrations typically found in soils, with the exception of magnesium. The significance of the presence of metals above background levels will be further evaluated during the risk assessment to be performed during the comprehensive RI/FS process.

If the analytical results can be validated and are considered to be acceptable, the following conclusions can be made:

- Concentrations of VOCs in soil do not exceed the preliminary comparison levels. Based on the existing data, concentrations of VOCs are low and are unlikely to pose a significant adverse impact to the environment. Sufficient VOC data have been collected for the RI/FS evaluation at this site.
- Concentrations of SVOCs in soil exceed the preliminary comparison level in only one sample from boring B410-7. It is believed that sufficient SVOC data have been collected for the RI/FS evaluation at this site.
- Sufficient soil metals data have been collected for the RI/FS evaluation.

The significance of the presence of these VOCs, SVOCs, and metals in soil will be further evaluated during the risk assessment to be performed during the comprehensive RI/FS work.

10.5.2 Groundwater

Four monitoring wells were installed by Canonic at Site 9. Based on water level measurements taken in November 1990, groundwater flow is generally to the southwest with a gradient of about 0.0005 foot/foot. Groundwater samples were taken from each well and analyzed for VOCs, SVOCs, metals, TOC, and general chemical characteristics. No VOCs or SVOCs were detected in the groundwater at Site 9 with the exception of methylene chloride, which was detected in the monitoring wells and in three travel blank samples. Therefore, the groundwater does not appear to have been impacted by VOCs and SVOCs.

Twelve metals are present in the groundwater at concentrations exceeding the 95 percent/95 percent statistical tolerance limit of background concentrations at NAS Alameda (PRC/JMM, 1992c). However, of

these metals, arsenic, iron, manganese, and potassium do not exceed the extreme upper limit of concentrations that can be found in typical groundwater samples. Vanadium was detected above extreme upper limits found in typical groundwater samples (Table 3-4). The concentrations of zinc in the groundwater samples exceed the background limit but do not exceed the typical concentration limit.

If the analytical results can be validated and are considered to be acceptable, the following conclusions can be made:

- Both upgradient and downgradient wells have similar concentrations of methylene chloride, and SVOCs were not detected at the site. However, an additional groundwater well should be installed in the vicinity of boring B410-7, where SVOCs in soil exceeded the preliminary comparison level, to evaluate whether SVOCs are present in the groundwater. Additional groundwater sampling is required to verify that the groundwater at the site has not been impacted by the VOCs.
- Metals are present in the groundwater at concentrations exceeding the 95 percent/95 percent statistical tolerance interval for NAS Alameda. Additional data are required to characterize the groundwater quality and to understand the seasonal changes in the groundwater quality at this site.
- Additional TDS data are required to evaluate whether groundwater beneath the site is considered potential drinking water.
- At present, no information is available to evaluate the tidal influence on the groundwater and the deeper groundwater-bearing zone. Additional work is required to evaluate the tidal influence and the deeper groundwater-bearing zone.

The significance of the presence of organics, if any, and metals in groundwater will be further evaluated during the risk assessment to be performed during the comprehensive RI/FS work.

SITE 9 - BUILDING 410, PAINT STRIPPING
SUMMARY OF LABORATORY ANALYSES PERFORMED ON SOIL AND GROUNDWATER SAMPLES
 (Sheet 1 of 5)

Boring	Depth	Matrix	Alkalinity/Acidity	Ammonia	Ammonium	Asbestos (Tot)	Ash (Tot)	SVOC	BTU Value	Cations/Anions	CEC	Cyanide (Tot)	DO (Tot)	EDB	Herb Uniq	Herbicides	Mercury	Metals	Pes/PCB	pH	Phosphorous	Potassium	Radiation	Spec. Con.	Kjeldahl Nitrogen	TOC	TPH as Diesel	TRPH/Oil & Grease	TS/TDS	VOC
B410-5	0.5-1.0	Soil				.										.														
B410-5	1.0-1.5	Soil							.															.						
B410-5	2.0-2.5	Soil				.																							.	
B410-5	2.5-3.0	Soil				.										.			.											
B410-5	5.0-5.5	Soil				.										.													.	
B410-5	5.5-6.0	Soil				.										.													.	
B410-5	8.0-8.5	Soil				.										.													.	
B410-5	8.5-9.0	Soil				.										.													.	
B410-5	10.5-11.0	Soil				.										.													.	
B410-5R	11.0-11.5	Soil				.										.													.	
B410-5	11.5-12.0	Soil				.										.													.	
B410-5	14.0-14.5	Soil				.										.													.	
B410-5	14.5-15.0	Soil				.										.													.	
B410-6	0.5-1.0	Soil				.										.													.	
B410-6	1.0-1.5	Soil				.			.							.								.					.
B410-6	2.0-2.5	Soil				.										.													.	
B410-6	3.5-4.0	Soil				.										.			.										.
B410-6	4.0-4.5	Soil				.										.			.										.
B410-6	5.5-6.0	Soil				.										.			.										.
B410-6	8.0-8.5	Soil				.										.			.										.
B410-6	8.5-9.0	Soil				.										.			.										.
B410-6	10.0-10.5	Soil				.										.			.										.
B410-6	11.0-11.5	Soil				.										.			.										.
B410-6	11.5-12.0	Soil				.										.			.										.
B410-6	12.5-13.0	Soil				.										.			.										.
B410-6	13.0-13.5	Soil				.										.			.										.
B410-6	14.5-15.0	Soil				.										.			.										.

TABLE 10-1

SITE 9 - BUILDING 410, PAINT STRIPPING
SUMMARY OF LABORATORY ANALYSES PERFORMED ON SOIL AND GROUNDWATER SAMPLES
(Sheet 2 of 5)

Boring	Depth	Matrix	Alkalinity/Acidity	Ammonia	Ammonium	Asbestos (Tot)	Ash (Tot)	SVOC	BTU Value	Cations/Anions	CEC	Cyanide (Tot)	DO (Tot)	EDB	Herb Uniq	Herbicides	Mercury	Metals	Pest/PCB	pH	Phosphorous	Potassium	Radiation	Spec. Con.	Kjeldahl Nitrogen	TOC	TPH as Diesel	TRPH/Oil&Grease	TS/TDS	VOC
B410-7	1.0-1.5	Soil				*											*													
B410-7	2.5-3.0	Soil				*											*												*	
B410-7	3.0-3.5	Soil															*		*											
B410-7	4.0-4.5	Soil							*																*					
B410-7	5.5-6.0	Soil				*																						*		
B410-7	6.0-6.5	Soil															*													
B410-7	8.5-9.0	Soil				*											*											*		
B410-7	9.0-9.5	Soil															*													
B410-7	11.0-11.5	Soil				*											*											*		
B410-7	11.5-12.0	Soil															*													
B410-7	14.5-15.0	Soil				*											*											*		
B410-7	15.0-15.5	Soil															*													
B410-8	1.0-1.5	Soil				*											*											*		
B410-8	1.5-2.0	Soil							*																*					
B410-8	2.5-3.0	Soil				*											*											*		
B410-8	3.0-3.5	Soil															*		*									*		
B410-8	4.0-4.5	Soil				*											*											*		
B410-8	4.5-5.0	Soil															*													
B410-8	5.5-6.0	Soil				*											*											*		
B410-8	6.0-6.5	Soil															*													
B410-8	7.0-7.5	Soil				*											*											*		
B410-8	7.5-8.0	Soil															*													
B410-8	8.5-9.0	Soil				*											*											*		
B410-8	9.0-9.5	Soil															*													
B410-9	1.0-1.5	Soil				*											*											*		
B410-9	1.5-2.0	Soil							*																*					
B410-9	2.5-3.0	Soil				*																						*		

SITE 9 - BUILDING 410, PAINT STRIPPING
SUMMARY OF LABORATORY ANALYSES PERFORMED ON SOIL AND GROUNDWATER SAMPLES
 (Sheet 3 of 5)

[illegible]

SITE 9 - BUILDING 410, PAINT STRIPPING
SUMMARY OF LABORATORY ANALYSES PERFORMED ON SOIL AND GROUNDWATER SAMPLES
(Sheet 4 of 5)

[illegible]

TABLE 10-1

SITE 9 - BUILDING 410, PAINT STRIPPING
SUMMARY OF LABORATORY ANALYSES PERFORMED ON SOIL AND GROUNDWATER SAMPLES
 (Sheet 5 of 5)

Boring	Depth	Matrix	Alkalinity/Acidity	Ammonia	Ammonium	Asbestos (Tot)	Ash (Tot)	SVOC	BTU Value	Cations/Anions	CEC	Cyanide (Tot)	DO (Tot)	EDB	Herb Uniq	Herbicides	Mercury	Metals	Pest/PCB	pH	Phosphorous	Potassium	Radiation	Spec. Con.	Kjeldahl Nitrogen	TOC	TPH as Diesel	TRPH/Oil&Grease	TS/TDS	VOC
MW410-4	9.0-9.5	Soil															•													
MW410-4	11.5-12.0	Soil					•										•													•
MW410-4	12-12.5	Soil																												
MW410-4	14.5-15.0	Soil					•																							•
MW410-4	15.0-15.5	Soil															•													
Summary		Soil					57		9								57		9						9					45
206	0.0	Water																												•
208	0.0	Water																												•
209	0.0	Water																												•
213	0.0	Water																												•
MW410-1	0.0	Water	•				•		•		•		•			•		•				•		•				•		•
MW410-2	0.0	Water	•				•		•		•		•			•		•				•		•				•		•
MW410-3	0.0	Water	•				•		•		•		•			•		•				•		•				•		•
MW410-4	0.0	Water	•				•		•		•		•			•		•				•		•				•		•
Summary		Water	4				4		4		4		4			4		4				4		4				4		8

Notes:

200-series boring numbers indicate travel blanks

Analysis	Methods	Matrix
DO	DO	water
Spec Con	EPA 120.1	water
pH	EPA 9045	soil
TOC	EPA/CE 81-1	soil
CEC	USBR 514.8	soil
Foaming Agents	EPA 425.1	water
Hardness	SM 314A	water

Analysis	Methods	Matrix
Metals	EPA 200.7	water
Metals	EPA 6010	soil
VOC	EPA 624	water
VOC	EPA 8240	soil
SVOC	EPA 8270	soil

Analysis	Methods	Matrix
TDS	EPA 160.1	water
Sulfate	EPA 300.0	water
Chloride	EPA 300.0(mod)	water
Acidity	EPA 305.1	water
Alkalinity	EPA 310.1	water
Alkalinity	EPA SM403	water

TABLE 10-2

**SITE 9 - BUILDING 410, PAINT STRIPPING
GEOTECHNICAL SAMPLE LABORATORY TEST RESULTS**

Sample No.	Depth (ft)	Soil Classification		Moisture Content (%)	Dry Density (pcf)	Specific Gravity	Hydraulic Conductivity (cm/s)
		Laboratory	Field				
MW410-1	2.5	SP	SM	NA	NA	2.70	NA
MW410-1	7	SP	SM	12.9	109.7	NA	NA
MW410-1	9.5	SP/SM	SM	NA	NA	NA	NA
MW410-2	10.5	SP/SM	SM	NA	NA	NA	NA
MW410-2	11	SP	SM	20.0	106.8	NA	NA
MW410-3	4.5	SP	SM	NA	NA	NA	NA
MW410-4	0.5	GP	SM	5.6	127.1	NA	NA
MW410-4	13.5	SM	SC	NA	NA	NA	NA
B410-5	4	SP	SM	5.1	102.6	NA	NA
B410-6	2.5	SP	SM	NA	NA	NA	NA
B410-7	10	SC	CL	41.1	79.5	NA	5.00E-08

Notes:

NA - Not Analyzed

Parameters not detected are reported as less than method detection limit.

Laboratory Methods (Units):

Soil Classification - Unified Soil Classification System (USCS) - ASTM D2488

Moisture Content - ASTM D2216 (percent)

Dry Density - ASTM D2937 (pounds per cubic foot)

Specific Gravity - ASTM D854

Hydraulic Conductivity - EPA 9100 (centimeters per second)

Soil Classification Legend:

GW	Well graded gravels, gravel-sand mixtures, little or no fines	SM	Silty sands, sand-silt mixtures
GP	Poorly graded gravels, gravel-sand mixtures, little or no fines	SC	Clayey sands, sand-clay mixtures
GM	Silty gravels, gravel-sand-silt mixtures	ML	Inorganic silts and very fine sands, rock flow silty or clayey fine sands or clayey silts with slight plasticity
GC	Clayey gravels, gravel-sand-clay mixtures	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
SW	Well graded sands, gravelly sands, little or no fines	OL	Organic silts and organic silty clays or low plasticity
SP	Poorly-graded sands, gravelly sands, little or no fines	CH	Inorganic clays of high plasticity, fat clays

TABLE 10-3

SITE 9 - BUILDING 410, PAINT STRIPPING
RESULTS FOR VOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 1 of 7)

Parameter Reported	B410-5 07/08/90 2-2.5 ft	B410-5 07/08/90 5-5.5 ft	B410-5 07/08/90 8-8.5 ft	B410-5 07/08/90 10.5-11 ft	B410-5 07/08/90 14-14.5 ft	B410-6 07/08/90 2-2.5 ft	B410-6 07/08/90 5.5-6 ft
Methylene Chloride (ug/kg)	10	11	6	8	11	10	13
Acetone (ug/kg)	9	6	10	24	54	10	11
Carbon Disulfide (ug/kg)	<5.00	<5.00	<6.00	<6.00	1	<5.00	<6.00
1,1-Dichloroethane (ug/kg)	<5.00	<5.00	<6.00	<6.00	<6.00	<5.00	<6.00
1,2-Dichloroethene (total) (ug/kg)	<5.00	<5.00	<6.00	<6.00	<6.00	<5.00	<6.00
1,2-Dichloroethane (ug/kg)	<5.00	<5.00	<6.00	<6.00	<6.00	<5.00	<6.00
2-Butanone (ug/kg)	<10.0	<11.0	<12.0	<12.0	<13.0	<10.0	<12.0
Tetrachloroethene (ug/kg)	<5.00	<5.00	<6.00	<6.00	<6.00	<5.00	<6.00
Toluene (ug/kg)	17	40	<6.00	32	54	38	28
Ethylbenzene (ug/kg)	<5.00	<5.00	<6.00	<6.00	<6.00	<5.00	<6.00
Xylenes (total) (ug/kg)	<5.00	<5.00	<6.00	<6.00	<6.00	<5.00	<6.00

Notes: NA = Not Analyzed

< = Detection Limit

ug/kg = micrograms per kilogram

Data not validated by JMM

TABLE 10-3

SITE 9 - BUILDING 410, PAINT STRIPPING
RESULTS FOR VOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
 (Sheet 2 of 7)

Parameter Reported	B410-6 07/08/90 8.5-9 ft	B410-6 07/08/90 11-11.5 ft	B410-6 07/08/90 13-13.5 ft	B410-7 07/12/90 2.5-3 ft	B410-7 07/16/90 5.5-6 ft	B410-7 07/16/90 8.5-9 ft	B410-7 07/16/90 11-11.5 ft
Methylene Chloride (ug/kg)	13	15	15	<27.0	6	12	8
Acetone (ug/kg)	8	22	20	<55	20	23	27
Carbon Disulfide (ug/kg)	<6.00	<6.00	2	<27.0	<6.00	<7.00	4
1,1-Dichloroethane (ug/kg)	<6.00	<6.00	<6.00	<27.0	<6.00	<7.00	<7.00
1,2-Dichloroethene (total) (ug/kg)	<6.00	<6.00	<6.00	<27.0	<6.00	<7.00	<7.00
1,2-Dichloroethane (ug/kg)	<6.00	<6.00	<6.00	<27.0	<6.00	<7.00	<7.00
2-Butanone (ug/kg)	<12.0	3	3	9	5	4	5
Tetrachloroethene (ug/kg)	<6.00	<6.00	<6.00	<27.0	<6.00	<7.00	<7.00
Toluene (ug/kg)	21	23	31	730	110	56	30
Ethylbenzene (ug/kg)	<6.00	<6.00	<6.00	<27.0	<6.00	<7.00	<7.00
Xylenes (total) (ug/kg)	<6.00	<6.00	<6.00	<27.0	<6.00	<7.00	<7.00

Notes: NA = Not Analyzed

< = Detection Limit

ug/kg = micrograms per kilogram

Data not validated by JMM

TABLE 10-3

SITE 9 - BUILDING 410, PAINT STRIPPING
RESULTS FOR VOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
 (Sheet 3 of 7)

Parameter Reported	B410-7 07/16/90 14.5-15 ft	B410-8 07/16/90 2.5-3 ft	B410-8 07/16/90 4-4.5 ft	B410-8 07/16/90 5.5-6 ft	B410-8 07/16/90 7-7.5 ft	B410-8 07/16/90 8.5-9 ft	B410-9 07/08/90 2.5-3 ft
Methylene Chloride (ug/kg)	11	10	10	11	10	17	18
Acetone (ug/kg)	16	8	9	6	14	5	12
Carbon Disulfide (ug/kg)	2	<5.00	<5.00	<5.00	<6.00	<6.00	<5.00
1,1-Dichloroethane (ug/kg)	<7.00	<5.00	<5.00	<5.00	5	<6.00	<5.00
1,2-Dichloroethene (total) (ug/kg)	<7.00	<5.00	<5.00	<5.00	4	3	<5.00
1,2-Dichloroethane (ug/kg)	<7.00	<5.00	<5.00	<5.00	<6.00	<6.00	<5.00
2-Butanone (ug/kg)	3	<11.0	<10.0	<11.0	3	<11.0	<10.0
Tetrachloroethene (ug/kg)	<7.00	1	<5.00	<5.00	<6.00	<6.00	<5.00
Toluene (ug/kg)	12	6	19	25	19	2	4
Ethylbenzene (ug/kg)	<7.00	<6.00	<5.00	<5.00	2	<6.00	<5.00
Xylenes (total) (ug/kg)	<7.00	<6.00	<5.00	<5.00	29	<6.00	<5.00

Notes: NA = Not Analyzed

< = Detection Limit

ug/kg = micrograms per kilogram

Data not validated by JMM

TABLE 10-3

SITE 9 - BUILDING 410, PAINT STRIPPING
RESULTS FOR VOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
 (Sheet 4 of 7)

Parameter Reported	B410-9 07/08/90 5.5-6 ft	B410-9 07/08/90 8.5-9 ft	B410-9 07/08/90 11.5-12 ft	B410-9 07/08/90 14.5-15 ft	MW410-1 07/01/90 2-2.5 ft	MW410-1 07/01/90 5.5-6 ft	MW410-1 07/01/90 7-7.5 ft
Methylene Chloride (ug/kg)	19	10	12	12	11	13	15
Acetone (ug/kg)	10	11	42	27	28	21	38
Carbon Disulfide (ug/kg)	<6.00	<6.00	<7.00	1	<5.00	<6.00	<7.00
1,1-Dichloroethane (ug/kg)	<6.00	<6.00	<7.00	<7.00	<5.00	<6.00	<7.00
1,2-Dichloroethene (total) (ug/kg)	<6.00	<6.00	<7.00	<7.00	<5.00	<6.00	<7.00
1,2-Dichloroethane (ug/kg)	<6.00	<6.00	<7.00	<7.00	<5.00	<6.00	<7.00
2-Butanone (ug/kg)	<12.0	2	4	4	<11.0	<11.0	<14.0
Tetrachloroethene (ug/kg)	<6.00	<6.00	<7.00	<7.00	<5.00	<6.00	<7.00
Toluene (ug/kg)	36	8	14	23	51	64	36
Ethylbenzene (ug/kg)	<6.00	<6.00	<7.00	<7.00	<5.00	<6.00	<7.00
Xylenes (total) (ug/kg)	<6.00	<6.00	<7.00	<7.00	<5.00	<6.00	<7.00

Notes: NA = Not Analyzed

< = Detection Limit

ug/kg = micrograms per kilogram

Data not validated by JMM

TABLE 10-3

SITE 9 - BUILDING 410, PAINT STRIPPING
RESULTS FOR VOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 5 of 7)

Parameter Reported	MW410-1 07/01/90 11-11.5 ft	MW410-1 07/01/90 14-14.5 ft	MW410-2 07/16/90 3-3.5 ft	MW410-2 07/16/90 6-6.5 ft	MW410-2 07/16/90 9-9.5 ft	MW410-2 07/16/90 12-12.5 ft	MW410-2 07/16/90 15-15.5 ft
Methylene Chloride (ug/kg)	13	14	8	15	10	15	17
Acetone (ug/kg)	24	22	9	8	9	20	27
Carbon Disulfide (ug/kg)	<6.00	1	<5.00	<5.00	<6.00	<6.00	<6.00
1,1-Dichloroethane (ug/kg)	<6.00	<6.00	<5.00	<5.00	<6.00	<6.00	<6.00
1,2-Dichloroethene (total) (ug/kg)	<6.00	<6.00	<5.00	<5.00	<6.00	<6.00	<6.00
1,2-Dichloroethane (ug/kg)	<6.00	<6.00	<5.00	<5.00	<6.00	<6.00	<6.00
2-Butanone (ug/kg)	<13.0	<13.0	<10.0	<11.0	<12.0	<13.0	4
Tetrachloroethene (ug/kg)	<6.00	<6.00	<5.00	<5.00	<6.00	<6.00	<6.00
Toluene (ug/kg)	27	22	81	6	11	9	9
Ethylbenzene (ug/kg)	<6.00	<6.00	<5.00	<5.00	<6.00	<6.00	<6.00
Xylenes (total) (ug/kg)	<6.00	<6.00	<5.00	<5.00	<6.00	<6.00	<6.00

Notes: NA = Not Analyzed

< = Detection Limit

ug/kg = micrograms per kilogram

Data not validated by JMM

TABLE 10-3

SITE 9 - BUILDING 410, PAINT STRIPPING
RESULTS FOR VOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
 (Sheet 6 of 7)

Parameter Reported	MW410-3 07/16/90 3-3.5 ft	MW410-3 07/16/90 5.5-6 ft	MW410-3 07/16/90 8.5-9 ft	MW410-3 07/16/90 11.5-12 ft	MW410-3 07/16/90 14.5-15 ft	MW410-4 07/16/90 3-3.5 ft	MW410-4 07/16/90 5.5-6 ft
Methylene Chloride (ug/kg)	5	6	7	7	6	11	10
Acetone (ug/kg)	13	12	15	14	13	6	9
Carbon Disulfide (ug/kg)	<5.00	<6.00	<6.00	<6.00	2	<5.00	<6.00
1,1-Dichloroethane (ug/kg)	<5.00	<6.00	<6.00	<6.00	<6.00	<5.00	<6.00
1,2-Dichloroethene (total) (ug/kg)	<5.00	<6.00	<6.00	<6.00	<6.00	<5.00	<6.00
1,2-Dichloroethane (ug/kg)	<5.00	<6.00	<6.00	<6.00	<6.00	<5.00	<6.00
2-Butanone (ug/kg)	<10.0	<12.0	<12.0	<12.0	<12.0	<10.0	<12.0
Tetrachloroethene (ug/kg)	<5.00	<6.00	<6.00	<6.00	<6.00	<5.00	<6.00
Toluene (ug/kg)	<5.00	3	5	7	7	7	23
Ethylbenzene (ug/kg)	<5.00	<6.00	<6.00	<6.00	<6.00	<5.00	<6.00
Xylenes (total) (ug/kg)	<5.00	<6.00	<6.00	<6.00	<6.00	<5.00	<6.00

Notes: NA = Not Analyzed

< = Detection Limit

ug/kg = micrograms per kilogram

Data not validated by JMM

TABLE 10-3

SITE 9 - BUILDING 410, PAINT STRIPPING
RESULTS FOR VOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
 (Sheet 7 of 7)

Parameter Reported	MW410-4 07/16/90 8.5-9 ft	MW410-4 07/16/90 11.5-12 ft	MW410-4 07/16/90 14.5-15 ft
Methylene Chloride (ug/kg)	13	14	17
Acetone (ug/kg)	10	11	19
Carbon Disulfide (ug/kg)	<6.00	<6.00	2
1,1-Dichloroethane (ug/kg)	<6.00	<6.00	<7.00
1,2-Dichloroethene (total) (ug/kg)	<6.00	<6.00	<7.00
1,2-Dichloroethane (ug/kg)	<6.00	<6.00	<7.00
2-Butanone (ug/kg)	<13.0	<12.0	4
Tetrachloroethene (ug/kg)	<6.00	<6.00	<7.00
Toluene (ug/kg)	7	10	7
Ethylbenzene (ug/kg)	<6.00	<6.00	<7.00
Xylenes (total) (ug/kg)	<6.00	<6.00	<7.00

Notes: NA = Not Analyzed

< = Detection Limit

ug/kg = micrograms per kilogram

Data not validated by JMM

TABLE 10-4

SITE 9 - BUILDING 410, PAINT STRIPPING
RESULTS FOR SEMIVOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 1 of 7)

Parameter Reported	B410-5 07/08/90 0.5-1 ft	B410-5 07/08/90 2-2.5 ft	B410-5 07/08/90 5-5.5 ft	B410-5 07/08/90 8-8.5 ft	B410-5 07/08/90 10.5-11 ft	B410-5 07/08/90 14-14.5 ft	B410-5R 07/08/90 11-11.5 ft
Phenol (ug/kg)	<340	<340	42	<390	<400	<850	<570
Naphthalene (ug/kg)	<340	<340	36	<390	<400	<850	<570
4-Chloro-3-methylphenol (ug/kg)	<340	<340	43	<390	<400	<850	<570
2-Methylnaphthalene (ug/kg)	<340	<340	<350	<390	<400	<850	<570
Acenaphthylene (ug/kg)	<340	<340	<350	<390	<400	<850	<570
Acenaphthene (ug/kg)	<340	<340	<350	<390	<400	<850	<570
Diethylphthalate (ug/kg)	<340	<340	<350	<390	<400	<850	<570
Fluorene (ug/kg)	<340	<340	<350	<390	<400	<850	<570
n-Nitroso-di-phenylamine (ug/kg)	42	45	59	55	50	96	85
Pentachlorophenol (ug/kg)	<1600	<1700	<1700	<1900	<1900	<4100	<2800
Phenanthrene (ug/kg)	<340	<340	<350	<390	<400	<850	<570
Anthracene (ug/kg)	<340	<340	<350	<390	<400	<850	<570
Di-n-butylphthalate (ug/kg)	<340	<340	42	<390	<400	<850	<570
Fluoranthene (ug/kg)	<340	<340	<350	<390	<400	<850	<570
Pyrene (ug/kg)	<340	<340	<350	<390	<400	95	85
Benzo(a)anthracene (ug/kg)	<340	<340	<350	<390	<400	<850	<570
Chrysene (ug/kg)	<340	<340	<350	<390	<400	<850	<570
bis(2-Ethylhexyl)phthalate (ug/kg)	<340	35	47	47	47	<850	<570
Benzo(b)fluoranthene (ug/kg)	<340	<340	<350	<390	<400	85	<570
Benzo(k)fluoranthene (ug/kg)	<340	<340	<350	<390	<400	<850	<570
Benzo(a)pyrene (ug/kg)	<340	<340	<350	<390	<400	<850	<570
Indeno(1,2,3-cd)pyrene (ug/kg)	<340	<340	<350	<390	<400	<850	<570
Dibenz(a,h)anthracene (ug/kg)	<340	<340	<350	<390	<400	<850	<570
Benzo(g,h,i)perylene (ug/kg)	<340	<340	<350	<390	<400	<850	<570

Notes: NA = Not Analyzed

< = Detection Limit

ug/kg = micrograms per kilogram

Data not validated by JMM

TABLE 10-4

SITE 9 - BUILDING 410, PAINT STRIPPING
RESULTS FOR SEMIVOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 2 of 7)

Parameter Reported	B410-6 07/08/90 0.5-1 ft	B410-6 07/08/90 2-2.5 ft	B410-6 07/08/90 5.5-6 ft	B410-6 07/08/90 8.5-9 ft	B410-6 07/08/90 11-11.5 ft	B410-6 07/08/90 11.5-12 ft	B410-6 07/08/90 13-13.5 ft
Phenol (ug/kg)	<690	<340	<390	<400	<410	<1100	<840
Naphthalene (ug/kg)	<690	<340	40	<400	<410	110	<840
4-Chloro-3-methylphenol (ug/kg)	<690	<340	<390	<400	<410	<1100	<840
2-Methylnaphthalene (ug/kg)	<690	<340	<390	<400	<410	<1100	<840
Acenaphthylene (ug/kg)	<690	<340	<390	<400	<410	<1100	<840
Acenaphthene (ug/kg)	<690	<340	<390	<400	<410	<1100	<840
Diethylphthalate (ug/kg)	<690	49	<390	<400	<410	<1100	<840
Fluorene (ug/kg)	<690	<340	<390	<400	<410	<1100	<840
n-Nitroso-di-phenylamine (ug/kg)	85	<340	69	65	<410	<1100	130
Pentachlorophenol (ug/kg)	<3300	<1600	<1900	<2000	<2000	930	<4100
Phenanthrene (ug/kg)	<690	<340	<390	<400	<410	140	91
Anthracene (ug/kg)	<690	<340	<390	<400	<410	<1100	<840
Di-n-butylphthalate (ug/kg)	<690	<340	45	<400	44	<1100	<840
Fluoranthene (ug/kg)	<690	<340	<390	<400	<410	320	160
Pyrene (ug/kg)	<690	<340	<390	<400	48	640	250
Benzo(a)anthracene (ug/kg)	<690	<340	<390	<400	<410	180	98
Chrysene (ug/kg)	<690	<340	<390	<400	<410	200	110
bis(2-Ethylhexyl)phthalate (ug/kg)	110	50	68	80	76	1000	99
Benzo(b)fluoranthene (ug/kg)	<690	<340	<390	<400	<410	400	360
Benzo(k)fluoranthene (ug/kg)	<690	<340	<390	<400	<410	<1100	120
Benzo(a)pyrene (ug/kg)	<690	<340	<390	<400	<410	290	260
Indeno(1,2,3-cd)pyrene (ug/kg)	<690	<340	<390	<400	<410	<1100	290
Dibenz(a,h)anthracene (ug/kg)	<690	<340	<390	<400	<410	<1100	<840
Benzo(g,h,i)perylene (ug/kg)	<690	<340	<390	<400	<410	430	330

Notes: NA = Not Analyzed
< = Detection Limit
ug/kg = micrograms per kilogram
Data not validated by JMM

TABLE 10-4

SITE 9 - BUILDING 410, PAINT STRIPPING
RESULTS FOR SEMIVOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
 (Sheet 3 of 7)

Parameter Reported	B410-7 07/12/90 2.5-3 ft	B410-7 07/16/90 5.5-6 ft	B410-7 07/16/90 8.5-9 ft	B410-7 07/16/90 11-11.5 ft	B410-7 07/16/90 14.5-15 ft	B410-8 07/16/90 2.5-3 ft	B410-8 07/16/90 4-4.5 ft
Phenol (ug/kg)	<730	<420	<460	<470	<410	<720	<350
Naphthalene (ug/kg)	<730	<420	<460	<470	<410	<720	<350
4-Chloro-3-methylphenol (ug/kg)	<730	<420	<460	<470	<410	<720	<350
2-Methylnaphthalene (ug/kg)	<730	<420	<460	<470	<410	<720	<350
Acenaphthylene (ug/kg)	<730	<420	<460	<470	130	<720	<350
Acenaphthene (ug/kg)	<730	<420	<460	<470	46	<720	<350
Diethylphthalate (ug/kg)	<730	<420	<460	<470	<410	<720	<350
Fluorene (ug/kg)	<730	<420	<460	<470	100	<720	<350
n-Nitroso-di-phenylamine (ug/kg)	<730	<420	<460	<470	<410	<720	38
Pentachlorophenol (ug/kg)	430	<2000	<2300	<2300	<2000	<3500	<1700
Phenanthrene (ug/kg)	<730	<420	<460	<470	1600	<720	<350
Anthracene (ug/kg)	<730	<420	<460	<470	390	<720	<350
Di-n-butylphthalate (ug/kg)	<730	<420	<460	<470	<410	<720	<350
Fluoranthene (ug/kg)	<730	150	95	100	2000	<720	<350
Pyrene (ug/kg)	95	290	690	940	2500	<720	<350
Benzo(a)anthracene (ug/kg)	<730	64	<460	<470	1000	<720	<350
Chrysene (ug/kg)	<730	69	80	100	1300	<720	<350
bis(2-Ethylhexyl)phthalate (ug/kg)	<730	57	160	<470	<410	200	59
Benzo(b)fluoranthene (ug/kg)	<730	66	140	400	760	<720	<350
Benzo(k)fluoranthene (ug/kg)	<730	140	250	<470	1100	<720	<350
Benzo(a)pyrene (ug/kg)	<730	140	270	310	1300	<720	<350
Indeno(1,2,3-cd)pyrene (ug/kg)	<730	120	230	<470	930	<720	<350
Dibenz(a,h)anthracene (ug/kg)	<730	<420	<460	<470	230	<720	<350
Benzo(g,h,i)perylene (ug/kg)	<730	170	260	<470	950	<720	<350

Notes: NA = Not Analyzed

< = Detection Limit

ug/kg = micrograms per kilogram

Data not validated by JMM

TABLE 10-4

SITE 9 - BUILDING 410, PAINT STRIPPING
RESULTS FOR SEMIVOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 4 of 7)

Parameter Reported	B410-8 07/16/90 5.5-6 ft	B410-8 07/16/90 7-7.5 ft	B410-8 07/16/90 8.5-9 ft	B410-9 07/12/90 1-1.5 ft	B410-9 07/08/90 5.5-6 ft	B410-9 07/08/90 14.5-15 ft	MW410-1 07/01/90 0.5-1 ft
Phenol (ug/kg)	<360	<390	<370	<670	<390	<450	<340
Naphthalene (ug/kg)	<360	<390	<370	<670	<390	<450	<340
4-Chloro-3-methylphenol (ug/kg)	<360	<390	<370	<670	<390	<450	<340
2-Methylnaphthalene (ug/kg)	<360	<390	<370	320	<390	<450	<340
Acenaphthylene (ug/kg)	<360	<390	<370	<670	<390	<450	<340
Acenaphthene (ug/kg)	<360	<390	<370	<670	<390	<450	<340
Diethylphthalate (ug/kg)	<360	<390	<370	<670	<390	<450	<340
Fluorene (ug/kg)	<360	<390	<370	<670	<390	<450	<340
n-Nitroso-di-phenylamine (ug/kg)	59	58	56	<670	<390	<450	54
Pentachlorophenol (ug/kg)	<1700	<1900	<1800	<3300	<1900	<2200	<1700
Phenanthrene (ug/kg)	<360	<390	<370	<670	<390	170	<340
Anthracene (ug/kg)	<360	<390	<370	<670	<390	59	<340
Di-n-butylphthalate (ug/kg)	<360	<390	<370	<670	<390	<450	<340
Fluoranthene (ug/kg)	<360	<390	<370	<670	<390	290	<340
Pyrene (ug/kg)	<360	<390	<370	<670	<390	420	<340
Benzo(a)anthracene (ug/kg)	<360	<390	<370	<670	<390	110	<340
Chrysene (ug/kg)	<360	<390	<370	72	<390	140	<340
bis(2-Ethylhexyl)phthalate (ug/kg)	59	65	45	<670	48	<450	57
Benzo(b)fluoranthene (ug/kg)	<360	<390	<370	<670	<390	220	<340
Benzo(k)fluoranthene (ug/kg)	<360	<390	<370	<670	<390	<450	<340
Benzo(a)pyrene (ug/kg)	<360	<390	<370	<670	<390	270	<340
Indeno(1,2,3-cd)pyrene (ug/kg)	<360	<390	<370	<670	<390	<450	<340
Dibenz(a,h)anthracene (ug/kg)	<360	<390	<370	<670	<390	<450	<340
Benzo(g,h,i)perylene (ug/kg)	<360	<390	<370	<670	<390	<450	<340

Notes: NA = Not Analyzed

< = Detection Limit

ug/kg = micrograms per kilogram

Data not validated by JMM

TABLE 10-4

SITE 9 - BUILDING 410, PAINT STRIPPING
RESULTS FOR SEMIVOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 5 of 7)

Parameter Reported	MW410-1 07/01/90 2-2.5 ft	MW410-1 07/01/90 5.5-6 ft	MW410-1 07/01/90 7-7.5 ft	MW410-1 07/01/90 11-11.5 ft	MW410-1 07/01/90 11.5-12 ft	MW410-1 07/01/90 14-14.5 ft	MW410-2 07/16/90 6-6.5 ft
Phenol (ug/kg)	<350	<380	<960	<420	<1000	<860	<350
Naphthalene (ug/kg)	35	<380	<960	<420	<1000	<860	<350
4-Chloro-3-methylphenol (ug/kg)	<350	<380	<960	<420	<1000	<860	<350
2-Methylnaphthalene (ug/kg)	<350	<380	<960	<420	<1000	<860	<350
Acenaphthylene (ug/kg)	<350	<380	<960	<420	<1000	<860	<350
Acenaphthene (ug/kg)	<350	<380	<960	<420	<1000	<860	<350
Diethylphthalate (ug/kg)	<350	<380	<960	85	<1000	<860	<350
Fluorene (ug/kg)	<350	<380	<960	<420	<1000	<860	<350
n-Nitroso-di-phenylamine (ug/kg)	<350	43	120	52	<1000	<860	47
Pentachlorophenol (ug/kg)	<1700	<1800	<4600	<2100	<4900	<4200	<1700
Phenanthrene (ug/kg)	260	<380	<960	<420	130	<860	<350
Anthracene (ug/kg)	<350	<380	<960	<420	<1000	<860	<350
Di-n-butylphthalate (ug/kg)	<350	<380	<960	<420	<1000	<860	<350
Fluoranthene (ug/kg)	460	<380	<960	<420	180	290	<350
Pyrene (ug/kg)	560	<380	<960	<420	450	650	<350
Benzo(a)anthracene (ug/kg)	170	<380	<960	<420	110	160	<350
Chrysene (ug/kg)	200	<380	<960	<420	140	180	<350
bis(2-Ethylhexyl)phthalate (ug/kg)	90	220	140	66	140	160	<350
Benzo(b)fluoranthene (ug/kg)	230	<380	<960	<420	230	<860	<350
Benzo(k)fluoranthene (ug/kg)	100	<380	<960	<420	<1000	<860	<350
Benzo(a)pyrene (ug/kg)	140	<380	<960	<420	210	310	<350
Indeno(1,2,3-cd)pyrene (ug/kg)	430	<380	<960	<420	<1000	<860	<350
Dibenz(a,h)anthracene (ug/kg)	<350	<380	<960	<420	<1000	<860	<350
Benzo(g,h,i)perylene (ug/kg)	140	<380	<960	<420	<1000	<860	<350

Notes: NA = Not Analyzed
< = Detection Limit
ug/kg = micrograms per kilogram
Data not validated by JMM

TABLE 10-4

SITE 9 - BUILDING 410, PAINT STRIPPING
RESULTS FOR SEMIVOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
 (Sheet 6 of 7)

Parameter Reported	MW410-2 07/16/90 9-9.5 ft	MW410-2 07/16/90 12-12.5 ft	MW410-2 07/16/90 15-15.5 ft	MW410-3 07/12/90 1-1.5 ft	MW410-3 07/16/90 8.5-9 ft	MW410-3 07/16/90 14.5-15 ft	MW410-4 07/16/90 11.5-12 ft
Phenol (ug/kg)	<410	<410	<420	<700	<400	<410	<400
Naphthalene (ug/kg)	<410	<410	<420	<700	<400	<410	<400
4-Chloro-3-methylphenol (ug/kg)	<410	<410	<420	<700	<400	<410	<400
2-Methylnaphthalene (ug/kg)	<410	<410	<420	<700	<400	<410	<400
Acenaphthylene (ug/kg)	<410	<410	<420	<700	<400	<410	<400
Acenaphthene (ug/kg)	<410	<410	<420	<700	<400	<410	<400
Diethylphthalate (ug/kg)	<410	<410	<420	<700	<400	<410	<400
Fluorene (ug/kg)	<410	<410	<420	<700	<400	<410	<400
n-Nitroso-di-phenylamine (ug/kg)	64	60	<420	<700	<400	<410	<400
Pentachlorophenol (ug/kg)	<2000	<2000	<2000	<3400	<2000	<2000	<2000
Phenanthrene (ug/kg)	<410	<410	<420	<700	<400	82	<400
Anthracene (ug/kg)	<410	<410	<420	<700	<400	<410	<400
Di-n-butylphthalate (ug/kg)	<410	<410	<420	<700	<400	<410	<400
Fluoranthene (ug/kg)	<410	<410	270	<700	<400	110	<400
Pyrene (ug/kg)	<410	<410	430	<700	<400	220	<400
Benzo(a)anthracene (ug/kg)	<410	<410	73	<700	<400	<410	<400
Chrysene (ug/kg)	<410	<410	83	<700	<400	<410	<400
bis(2-Ethylhexyl)phthalate (ug/kg)	<410	<410	77	98	48	<410	52
Benzo(b)fluoranthene (ug/kg)	<410	<410	150	<700	<400	81	<400
Benzo(k)fluoranthene (ug/kg)	<410	<410	58	<700	<400	170	<400
Benzo(a)pyrene (ug/kg)	<410	<410	170	<700	<400	180	<400
Indeno(1,2,3-cd)pyrene (ug/kg)	<410	<410	130	<700	<400	140	<400
Dibenz(a,h)anthracene (ug/kg)	<410	<410	<420	<700	<400	<410	<400
Benzo(g,h,i)perylene (ug/kg)	<410	<410	<420	<700	<400	190	<400

Notes: NA = Not Analyzed

< = Detection Limit

ug/kg = micrograms per kilogram

Data not validated by JMM

TABLE 10-4

SITE 9 - BUILDING 410, PAINT STRIPPING
RESULTS FOR SEMIVOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
 (Sheet 7 of 7)

Parameter Reported	MW410-4 07/16/90 14.5-15 ft
Phenol (ug/kg)	<430
Naphthalene (ug/kg)	<430
4-Chloro-3-methylphenol (ug/kg)	<430
2-Methylnaphthalene (ug/kg)	<430
Acenaphthylene (ug/kg)	<430
Acenaphthene (ug/kg)	<430
Diethylphthalate (ug/kg)	<430
Fluorene (ug/kg)	<430
n-Nitroso-di-phenylamine (ug/kg)	<430
Pentachlorophenol (ug/kg)	<2100
Phenanthrene (ug/kg)	120
Anthracene (ug/kg)	<430
Di-n-butylphthalate (ug/kg)	<430
Fluoranthene (ug/kg)	200
Pyrene (ug/kg)	320
Benzo(a)anthracene (ug/kg)	86
Chrysene (ug/kg)	120
bis(2-Ethylhexyl)phthalate (ug/kg)	51
Benzo(b)fluoranthene (ug/kg)	130
Benzo(k)fluoranthene (ug/kg)	210
Benzo(a)pyrene (ug/kg)	240
Indeno(1,2,3-cd)pyrene (ug/kg)	200
Dibenz(a,h)anthracene (ug/kg)	<430
Benzo(g,h,i)perylene (ug/kg)	250

Notes: NA = Not Analyzed

< = Detection Limit

ug/kg = micrograms per kilogram

Data not validated by JMM

TABLE 10-5

**SITE 9 - BUILDING 410, PAINT STRIPPING
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
(Sheet 1 of 9)**

Parameter Reported	B410-5 07/08/90 0.5-1 ft	B410-5 07/11/90 2.5-3 ft	B410-5 07/08/90 5.5-6 ft	B410-5 07/08/90 8.5-9 ft	B410-5 07/08/90 11.5-12 ft	B410-5 07/08/90 14.5-15 ft	B410-5R 07/08/90 11-11.5 ft
Aluminum (mg/kg)	3260	3110	2950	4020	19300	5270	28800
Arsenic (mg/kg)	3.8	2.2	<2.10	<2.20	10	5.8	9.7
Barium (mg/kg)	24.4	17.3	18.5	21.3	81	17.5	91.5
Beryllium (mg/kg)	0.09	0.091	0.15	0.11	0.6	0.16	0.81
Cadmium (mg/kg)	0.32	0.27	<0.210	0.3	0.97	0.32	0.99
Calcium (mg/kg)	2320	1360	1340	1360	4240	3740	4050
Chromium (mg/kg)	24.1	24.2	24.7	27.6	86	27.4	107
Cobalt (mg/kg)	3.6	3.8	3.9	3.7	16.6	6.9	18.4
Copper (mg/kg)	8.8	6	4.3	6	35.3	10.1	43.9
Iron (mg/kg)	6260	5950	5510	7140	31500	8820	39000
Lead (mg/kg)	<3.50	<3.50	<3.90	<4.10	16.2	8.2	13.4
Magnesium (mg/kg)	1810	1820	1730	2240	9570	2720	10200
Manganese (mg/kg)	95.8	73.6	62.5	79.1	461	120	375
Nickel (mg/kg)	17.8	20.6	20.2	25	96.8	23.3	111
Potassium (mg/kg)	390	524	455	743	3110	1190	3740
Silver (mg/kg)	<0.370	<0.380	<0.420	<0.440	0.96	<0.460	<0.620
Sodium (mg/kg)	231	336	129	375	2800	855	2900
Thallium (mg/kg)	<3.20	<3.30	<3.70	<3.80	<5.30	<4.00	<5.40
Titanium (mg/kg)	281	263	249	321	615	276	1190
Vanadium (mg/kg)	14.8	14.4	12.7	16	55.3	18.9	70.8
Zinc (mg/kg)	24.7	19.6	18.8	25.5	105	36.3	102

Notes: NA = Not Analyzed
 < = Detection Limit
 mg/kg = milligrams per kilogram
 Data not validated by JMM

TABLE 10-5

SITE 9 - BUILDING 410, PAINT STRIPPING
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
 (Sheet 2 of 9)

Parameter Reported	B410-6 07/08/90 0.5-1 ft	B410-6 07/11/90 3.5-4 ft	B410-6 07/08/90 4-4.5 ft	B410-6 07/08/90 8-8.5 ft	B410-6 07/08/90 10-10.5 ft	B410-6 07/08/90 12.5-13 ft	B410-6 07/08/90 14.5-15 ft
Aluminum (mg/kg)	4540	4150	4400	4260	4090	10900	6200
Arsenic (mg/kg)	4.2	4.3	2.6	3.4	<2.20	6.5	3.4
Barium (mg/kg)	38	18.8	23.3	23.6	36.8	61.9	57.1
Beryllium (mg/kg)	0.17	0.13	0.13	0.11	0.1	0.48	0.2
Cadmium (mg/kg)	0.22	0.22	<0.190	<0.220	0.23	0.64	<0.220
Calcium (mg/kg)	5710	2220	2430	2130	1940	3590	1600
Chromium (mg/kg)	37.3	29.1	30.4	29.9	31	57	41.3
Cobalt (mg/kg)	4.2	4.4	4.2	3.7	3.8	9.8	5.7
Copper (mg/kg)	5.3	5.9	4.5	5.8	5	18.7	9.5
Iron (mg/kg)	7340	6830	6950	6940	6770	18300	11200
Lead (mg/kg)	<3.50	<3.50	<3.60	<4.10	<4.00	8.8	<4.20
Magnesium (mg/kg)	2150	2120	2110	1980	1950	5380	2890
Manganese (mg/kg)	92.8	83	83	80.4	85.7	267	125
Nickel (mg/kg)	23.5	23	22.3	21.6	21.9	56	38.5
Potassium (mg/kg)	638	582	573	620	622	1840	1070
Silver (mg/kg)	0.38	<0.380	<0.390	<0.440	<0.420	<0.540	<0.450
Sodium (mg/kg)	272	200	166	219	478	2420	1620
Thallium (mg/kg)	<3.30	3.3	<3.40	<3.90	<3.70	<4.70	<3.90
Titanium (mg/kg)	419	413	428	404	353	517	312
Vanadium (mg/kg)	18.8	17.7	17.5	17.6	17.7	35.2	20.6
Zinc (mg/kg)	21.5	22.9	22.1	25.3	21.9	54.4	28.3

Notes: NA = Not Analyzed
 < = Detection Limit
 mg/kg = milligrams per kilogram
 Data not validated by JMM

TABLE 10-5

**SITE 9 - BUILDING 410, PAINT STRIPPING
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
(Sheet 3 of 9)**

Parameter Reported	B410-7 07/12/90 1-1.5 ft	B410-7 07/12/90 3-3.5 ft	B410-7 07/12/90 6-6.5 ft	B410-7 07/12/90 9-9.5 ft	B410-7 07/12/90 11.5-12 ft	B410-7 07/12/90 15-15.5 ft	B410-8 07/16/90 1-1.5 ft
Aluminum (mg/kg)	4360	3380	7070	16000	16100	7580	3520
Arsenic (mg/kg)	3.3	<2.60	<3.00	5	6.1	3.2	<11.0
Barium (mg/kg)	53.4	22.3	128	58.5	98.2	29.2	94
Beryllium (mg/kg)	<0.200	<0.200	<0.200	0.4	0.4	0.3	<1.10
Cadmium (mg/kg)	0.3	0.2	<0.200	0.7	0.5	0.3	<1.10
Calcium (mg/kg)	5730	1750	1950	2950	2910	2640	4200
Chromium (mg/kg)	29.4	25.8	41.4	66.1	81.7	44.3	27
Cobalt (mg/kg)	4.2	4.1	6.4	12.8	13.7	6.7	<5.30
Copper (mg/kg)	39.8	10.7	10.9	24.5	14.9	10.7	36
Iron (mg/kg)	7920	6170	11900	25700	26400	11900	6280
Lead (mg/kg)	<5.20	<5.40	<6.20	10.9	<6.80	<6.00	<5.30
Magnesium (mg/kg)	2230	2020	3170	7950	6140	3470	1700
Manganese (mg/kg)	128	80.1	125	327	241	113	68
Nickel (mg/kg)	20.3	20.8	33.9	67.5	88.5	40.6	19
Potassium (mg/kg)	910	470	1110	2600	2200	1300	570
Silver (mg/kg)	<0.600	<0.600	<0.700	<0.800	<0.800	<0.700	<5.30
Sodium (mg/kg)	266	208	939	3510	3410	1130	<530
Thallium (mg/kg)	<2.70	<2.80	<3.20	<3.70	<3.50	<3.10	<11.0
Titanium (mg/kg)	363	245	465	451	756	479	320
Vanadium (mg/kg)	17.5	14	26.3	41.5	46.3	26	15
Zinc (mg/kg)	40.4	27.4	34.9	63.4	54.2	31.8	40

Notes: NA = Not Analyzed

< = Detection Limit

mg/kg = milligrams per kilogram

Data not validated by JMM

TABLE 10-5

**SITE 9 - BUILDING 410, PAINT STRIPPING
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
(Sheet 4 of 9)**

Parameter Reported	B410-8 07/16/90 3-3.5 ft	B410-8 07/16/90 4.5-5 ft	B410-8 07/16/90 6-6.5 ft	B410-8 07/16/90 7.5-8 ft	B410-8 07/16/90 9-9.5 ft	B410-9 07/12/90 1-1.5 ft	B410-9 07/12/90 3-3.5 ft
Aluminum (mg/kg)	3630	3340	3680	3330	3070	11900	3880
Arsenic (mg/kg)	<10.0	<10.0	<12.0	<12.0	<12.0	5.9	<2.40
Barium (mg/kg)	66	86	51	42	28	198	22.9
Beryllium (mg/kg)	<1.00	<1.00	<1.20	<1.20	<1.20	0.6	<0.200
Cadmium (mg/kg)	<1.00	<1.00	<1.20	<1.20	<1.20	0.3	<0.200
Calcium (mg/kg)	12000	5300	2300	2100	2200	12700	3060
Chromium (mg/kg)	22	22	25	23	19	24.9	30.5
Cobalt (mg/kg)	<5.20	<5.20	<5.80	<5.80	<6.00	11.1	4.3
Copper (mg/kg)	9	6.7	7	6.2	7.7	89.4	19.4
Iron (mg/kg)	6280	5980	5660	5680	5370	19300	6410
Lead (mg/kg)	<5.20	<5.20	<5.80	<5.80	<6.00	9.1	<5.10
Magnesium (mg/kg)	1700	1600	1600	1600	1600	5860	1800
Manganese (mg/kg)	80	76	64	63	72	1050	85.1
Nickel (mg/kg)	18	18	17	18	17	33.7	18.3
Potassium (mg/kg)	530	540	<580	650	<600	2400	470
Silver (mg/kg)	<5.20	<5.20	<5.80	<5.80	<6.00	<0.600	<0.600
Sodium (mg/kg)	<520	<520	<580	<580	<600	343	157
Thallium (mg/kg)	<10.0	<10.0	<12.0	<12.0	<12.0	<2.70	<2.70
Titanium (mg/kg)	330	320	350	310	310	1020	366
Vanadium (mg/kg)	16	15	16	15	13	31.9	16.6
Zinc (mg/kg)	19	14	14	14	16	80.6	27.5

Notes: NA = Not Analyzed

< = Detection Limit

mg/kg = milligrams per kilogram

Data not validated by JMM

TABLE 10-5

**SITE 9 - BUILDING 410, PAINT STRIPPING
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
(Sheet 5 of 9)**

Parameter Reported	B410-9 07/12/90 6-6.5 ft	B410-9 07/12/90 9-9.5 ft	B410-9 07/12/90 12-12.5 ft	B410-9 07/12/90 15-15.5 ft	MW410-1 07/01/90 0.5-1 ft	MW410-1 07/01/90 3-3.5 ft	MW410-1 07/01/90 6.5-7 ft
Aluminum (mg/kg)	2900	2880	4660	8970	2890	3270	3280
Arsenic (mg/kg)	3.5	<3.00	<3.10	6	<1.90	3.5	3.1
Barium (mg/kg)	29.5	49.4	31.1	56.4	16.3	21.3	31.1
Beryllium (mg/kg)	<0.200	<0.300	<0.300	<0.300	0.092	0.092	0.11
Cadmium (mg/kg)	<0.200	<0.300	<0.300	0.4	0.19	0.23	0.25
Calcium (mg/kg)	2360	19200	2080	2850	1680	17600	1640
Chromium (mg/kg)	24.4	22.1	32.2	51.6	22.7	23.3	27.1
Cobalt (mg/kg)	3.4	2.9	4.7	8.5	3.4	3.6	3.3
Copper (mg/kg)	7.6	7.7	12.6	23.6	6.1	5.7	4.2
Iron (mg/kg)	5350	5090	8180	15400	5480	5690	5920
Lead (mg/kg)	<5.90	<6.30	<6.50	12.9	<3.50	<3.50	<4.10
Magnesium (mg/kg)	1570	1620	2720	4370	1710	1810	1850
Manganese (mg/kg)	67.6	97	96	157	68.4	76.9	95.8
Nickel (mg/kg)	16.5	14.6	29.3	46.8	20	19.3	19.9
Potassium (mg/kg)	310	340	860	1500	541	492	507
Silver (mg/kg)	<0.700	<0.800	<0.800	<0.800	<0.380	<0.380	<0.440
Sodium (mg/kg)	109	225	222	1080	121	194	173
Thallium (mg/kg)	<3.10	<3.30	<3.40	<3.40	<3.30	<3.30	<3.80
Titanium (mg/kg)	282	274	365	609	223	284	282
Vanadium (mg/kg)	13.8	12.8	17.1	30.2	13	14.5	13.5
Zinc (mg/kg)	17.7	17.4	33.3	53.5	21.1	19.9	21

Notes: NA = Not Analyzed
 < = Detection Limit
 mg/kg = milligrams per kilogram
 Data not validated by JMM

TABLE 10-5

**SITE 9 - BUILDING 410, PAINT STRIPPING
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
(Sheet 6 of 9)**

Parameter Reported	MW410-1 07/01/90 7.5-8 ft	MW410-1 07/01/90 8-8.5 ft	MW410-1 07/01/90 12.5-13 ft	MW410-1 07/01/90 14.5-15 ft	MW410-2 07/16/90 1.5-2 ft	MW410-2 07/16/90 3.5-4 ft	MW410-2 07/16/90 6.5-7 ft
Aluminum (mg/kg)	4320	3620	16200	6140	3670	3720	3300
Arsenic (mg/kg)	<2.20	2.8	6.2	<2.40	<10.0	<10.0	<11.0
Barium (mg/kg)	26.9	24.5	107	44.3	29	42	45
Beryllium (mg/kg)	0.15	0.1	0.54	0.21	<1.00	<1.00	<1.10
Cadmium (mg/kg)	<0.210	0.28	0.82	0.32	<1.00	<1.00	<1.10
Calcium (mg/kg)	2310	2800	14300	7180	2300	2600	6400
Chromium (mg/kg)	32.6	28.4	73.6	40.4	25	25	21
Cobalt (mg/kg)	4.2	3.8	14	5.8	<5.20	23	<5.60
Copper (mg/kg)	11.9	4.6	25.6	10.8	7.8	23	6.1
Iron (mg/kg)	7290	6070	26900	10900	6810	6830	5450
Lead (mg/kg)	<4.00	<4.00	10	<4.40	<5.20	7	<5.60
Magnesium (mg/kg)	2190	1870	9920	3380	1900	<520	1700
Manganese (mg/kg)	86.1	77.4	1060	102	80	81	70
Nickel (mg/kg)	24.4	20.2	86.5	39.4	21	21	17
Potassium (mg/kg)	645	581	2640	1190	650	650	<560
Silver (mg/kg)	<0.430	0.44	0.61	<0.470	<5.20	<5.20	<5.60
Sodium (mg/kg)	169	138	1830	413	<520	<520	<560
Thallium (mg/kg)	<3.70	<3.70	5.3	<4.10	<10.0	<10.0	<11.0
Titanium (mg/kg)	419	358	640	329	330	320	340
Vanadium (mg/kg)	18.1	15.3	47.9	21.3	16	16	14
Zinc (mg/kg)	26.4	18.7	74.4	34.2	18	25	12

Notes: NA = Not Analyzed
 < = Detection Limit
 mg/kg = milligrams per kilogram
 Data not validated by JMM

TABLE 10-5

**SITE 9 - BUILDING 410, PAINT STRIPPING
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
(Sheet 7 of 9)**

Parameter Reported	MW410-2 07/16/90 9.5-10 ft	MW410-2 07/16/90 12.5-13 ft	MW410-2 07/16/90 15.5-16 ft	MW410-3 07/12/90 1-1.5 ft	MW410-3 07/12/90 4-4.5 ft	MW410-3 07/12/90 6-6.5 ft	MW410-3 07/12/90 9-9.5 ft
Aluminum (mg/kg)	3750	3550	5220	3920	3110	3860	3690
Arsenic (mg/kg)	<12.0	<12.0	<13.0	<2.60	2.9	<2.80	<2.90
Barium (mg/kg)	24	<24.0	<25.0	51.2	44	29.2	22.1
Beryllium (mg/kg)	<1.20	<1.20	<1.30	<0.200	<0.200	<0.200	<0.200
Cadmium (mg/kg)	<1.20	<1.20	<1.30	0.2	<0.200	<0.200	0.3
Calcium (mg/kg)	2000	1700	3500	14000	12400	2190	1910
Chromium (mg/kg)	25	22	20	34.4	26.5	38.7	26.8
Cobalt (mg/kg)	<6.00	<6.10	<6.30	4.5	3.4	3.9	4.1
Copper (mg/kg)	6	20	58	27.9	7.6	9.6	6.5
Iron (mg/kg)	5960	6220	7970	6660	5650	6730	6390
Lead (mg/kg)	<6.00	<6.10	8.6	<5.30	<5.30	<5.90	<6.00
Magnesium (mg/kg)	2000	1900	2400	1990	1710	2030	2020
Manganese (mg/kg)	73	73	110	135	84.2	80.4	79.5
Nickel (mg/kg)	20	20	23	23.1	17.7	20.8	21.2
Potassium (mg/kg)	660	<610	880	560	370	470	610
Silver (mg/kg)	<6.00	<6.10	<6.30	<0.600	<0.600	<0.700	<0.700
Sodium (mg/kg)	<600	<610	<630	244	224	147	234
Thallium (mg/kg)	<12.0	<12.0	<13.0	<2.80	<2.80	<3.10	<3.10
Titanium (mg/kg)	360	340	280	329	252	358	324
Vanadium (mg/kg)	16	15	18	16.7	14.6	17.3	16
Zinc (mg/kg)	16	22	52	32.5	20.2	21.4	24.8

Notes: NA = Not Analyzed

< = Detection Limit

mg/kg = milligrams per kilogram

Data not validated by JMM

TABLE 10-5

**SITE 9 - BUILDING 410, PAINT STRIPPING
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
(Sheet 8 of 9)**

Parameter Reported	MW410-3 07/12/90 12-12.5 ft	MW410-3 07/12/90 15-15.5 ft	MW410-4 07/12/90 1-1.5 ft	MW410-4 07/12/90 4-4.5 ft	MW410-4 07/12/90 6-6.5 ft	MW410-4 07/12/90 9-9.5 ft	MW410-4 07/12/90 12-12.5 ft
Aluminum (mg/kg)	4570	3890	3300	2940	3960	3370	5170
Arsenic (mg/kg)	<2.90	3.7	<2.40	<2.50	<3.00	<2.90	<2.80
Barium (mg/kg)	25.7	17.5	108	19.9	32.4	16.7	32.3
Beryllium (mg/kg)	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200
Cadmium (mg/kg)	0.5	<0.200	<0.200	<0.200	0.3	<0.200	0.3
Calcium (mg/kg)	2040	4960	9970	1860	2310	1410	2030
Chromium (mg/kg)	29.6	25.3	23.4	22.5	32.8	23.5	32.8
Cobalt (mg/kg)	5	4.9	3.6	3.3	4.4	3.6	4.7
Copper (mg/kg)	9.7	12.1	10.7	6.1	8.9	6.5	10
Iron (mg/kg)	7420	6370	5600	5420	7030	5680	8500
Lead (mg/kg)	<6.00	<5.90	<5.10	<5.20	<6.20	<6.00	<5.90
Magnesium (mg/kg)	2350	1810	1840	1640	2140	1770	2520
Manganese (mg/kg)	90.4	81.5	74.1	69.8	86.5	70.6	93.7
Nickel (mg/kg)	24.1	17.4	18.9	18.5	22.1	18.6	27.5
Potassium (mg/kg)	700	720	460	390	550	500	910
Silver (mg/kg)	<0.700	<0.700	<0.600	<0.600	<0.700	<0.700	<0.700
Sodium (mg/kg)	453	445	252	185	143	206	555
Thallium (mg/kg)	<3.10	<3.10	<2.60	<2.70	<3.20	<3.10	<3.10
Titanium (mg/kg)	367	223	294	234	418	262	435
Vanadium (mg/kg)	17.2	13.6	14	12.9	18.7	13.1	19.3
Zinc (mg/kg)	27.8	26.6	26.8	19.9	24	24.9	30.4

Notes: NA = Not Analyzed

< = Detection Limit

mg/kg = milligrams per kilogram

Data not validated by JMM

TABLE 10-5

**SITE 9 - BUILDING 410, PAINT STRIPPING
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
(Sheet 9 of 9)**

Parameter Reported	MW410-4 07/12/90 15-15.5 ft
Aluminum (mg/kg)	6160
Arsenic (mg/kg)	4
Barium (mg/kg)	31.3
Beryllium (mg/kg)	<0.300
Cadmium (mg/kg)	<0.300
Calcium (mg/kg)	6740
Chromium (mg/kg)	31.9
Cobalt (mg/kg)	7
Copper (mg/kg)	19.9
Iron (mg/kg)	10700
Lead (mg/kg)	9.8
Magnesium (mg/kg)	3030
Manganese (mg/kg)	144
Nickel (mg/kg)	30.2
Potassium (mg/kg)	1200
Silver (mg/kg)	<0.800
Sodium (mg/kg)	788
Thallium (mg/kg)	<3.30
Titanium (mg/kg)	403
Vanadium (mg/kg)	22.8
Zinc (mg/kg)	40.6

Notes: NA = Not Analyzed

< = Detection Limit

mg/kg = milligrams per kilogram

Data not validated by JMM

TABLE 10-6

**SITE 9 - BUILDING 410, PAINT STRIPPING
RESULTS FOR GENERAL CHEMICAL CHARACTERISTICS IN SOIL SAMPLES**

Parameter Reported	B410-5 07/11/90 1-1.5 ft	B410-6 07/11/90 1-1.5 ft	B410-7 07/12/90 4-4.5 ft	B410-8 07/16/90 1.5-2 ft	B410-9 07/12/90 1.5-2 ft	MW410-1 07/11/90 1-1.5 ft	MW410-2 07/16/90 2-2.5 ft
Total Organic Carbon							
Total Organic Carbon (mg/kg)	316	210	1680	473	263	263	263
Characteristic Measurements							
pH (Units)	9.95	9.7	9.57	8.3	9.3	9.37	10
Cations/Anions							
Cation Exchange Capacity (meq/hg)	3.12	2.72	5.6	2.8	3.12	2.88	2.88
Parameter Reported	MW410-3 07/12/90 1.5-2 ft	MW410-4 07/12/90 2.5-3 ft					
Total Organic Carbon							
Total Organic Carbon (mg/kg)	263	210					
Characteristic Measurements							
pH (Units)	9.39	9.89					
Cations/Anions							
Cation Exchange Capacity (meq/hg)	2.56	2.08					

Notes: NA = Not Analyzed
 < = Detection Limit
 mg/kg = milligrams per kilogram
 meq/hg = milliequivalents per inch of mercury
 Data not validated by JMM

TABLE 10-7

**SITE 9 - BUILDING 410, PAINT STRIPPING
RESULTS FOR VOLATILE ORGANIC COMPOUNDS DETECTED IN GROUNDWATER SAMPLES**

Parameter Reported	206	209	213	MW410-1	MW410-2	MW410-3	MW410-4
	08/21/90	08/21/90	08/22/90	08/21/90	08/22/90	08/21/90	08/22/90
	0-0 ft	0-0 ft	0-0 ft	0-0 ft	0-0 ft	0-0 ft	0-0 ft
Methylene Chloride (ug/L)	10	8	8	11	10	11	10

Notes: NA = Not Analyzed
 < = Detection Limit
 ug/L = micrograms per liter
 Data not validated by JMM

TABLE 10-8

**SITE 9 - BUILDING 410, PAINT STRIPPING
RESULTS FOR METALS DETECTED IN GROUNDWATER SAMPLES**

Parameter Reported	MW410-1	MW410-2	MW410-3	MW410-4
	08/21/90 0-0 ft	08/22/90 0-0 ft	08/21/90 0-0 ft	08/22/90 0-0 ft
Aluminum (mg/L)	89	38	98	85
Arsenic (mg/L)	0.054	<0.050	0.07	<0.050
Barium (mg/L)	0.33	0.3	0.62	0.35
Calcium (mg/L)	30	57	83	36
Chromium (mg/L)	0.27	0.15	0.35	0.34
Cobalt (mg/L)	<0.050	<0.050	0.063	0.06
Copper (mg/L)	0.12	0.074	0.14	0.12
Iron (mg/L)	114	57	136	136
Lead (mg/L)	0.088	<0.050	0.09	0.058
Magnesium (mg/L)	41	35	65	40
Manganese (mg/L)	1.5	0.87	1.5	1.2
Nickel (mg/L)	0.29	0.17	0.47	0.36
Potassium (mg/L)	26	19	39	23
Selenium (mg/L)	<0.050	<0.050	<0.050	0.055
Silver (mg/L)	0.013	<0.010	<0.010	<0.010
Sodium (mg/L)	246	151	143	53
Titanium (mg/L)	2.4	1.4	3.9	2.6
Vanadium (mg/L)	0.23	0.11	0.28	0.25
Zinc (mg/L)	0.31	0.16	0.35	0.28

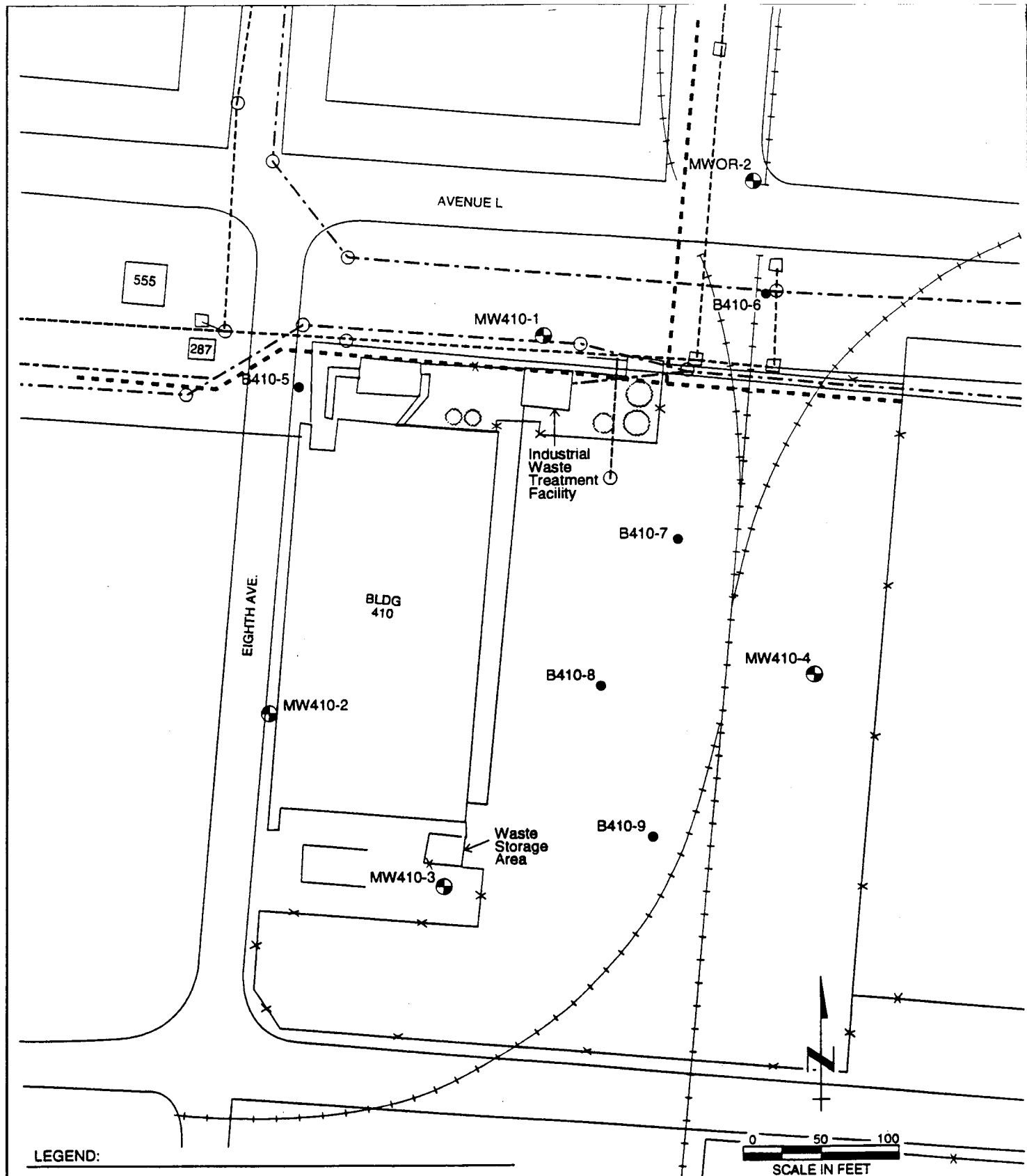
Notes: NA = Not Analyzed
 < = Detection Limit
 mg/L = milligram per liter
 Data not validated by JMM

TABLE 10-9

**SITE 9 - BUILDING 410, PAINT STRIPPING
RESULTS FOR GENERAL CHEMICAL CHARACTERISTICS IN GROUNDWATER SAMPLES**

Parameter Reported	MW410-1 08/21/90 0-0 ft	MW410-2 08/22/90 0-0 ft	MW410-3 08/21/90 0-0 ft	MW410-4 08/22/90 0-0 ft
Miscellaneous Measurements				
Alkalinity, bicarb (as CaCO ₃) (mg/L)	220	470	450	150
Alkalinity, carb (as CaCO ₃) (mg/L)	<5.00	<5.00	<5.00	8
Alkalinity, total (as CaCO ₃) (mg/L)	220	470	450	160
Chloride (mg/L)	382	28	42	13
Foaming Agents (MBAs) (mg/L)	<0.100	0.38	<0.100	<0.100
Sulfate (mg/L)	15	43	140	18
Total Dissolved Solids (mg/L)	990	660	846	320
Total Hardness (as CaCO ₃) (mg/L)	244	290	475	250
Total Organic Carbon				
Total Organic Carbon (mg/L)	4.7	12	7.2	7.8
Characteristic Measurements				
Dissolved Oxygen (mg/L)	4.3	4.2	3.8	4.4
pH (Units)	7.8	7.7	7.4	8.4
Cations/Anions				
Specific Conductivity (umhos)	1560	1020	1070	380

Notes: NA = Not Analyzed
 < = Detection Limit
 mg/L = milligrams per liter
 umhos = micromhos per centimeter
 Data not validated by JMM



LEGEND:

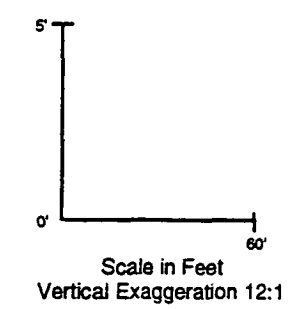
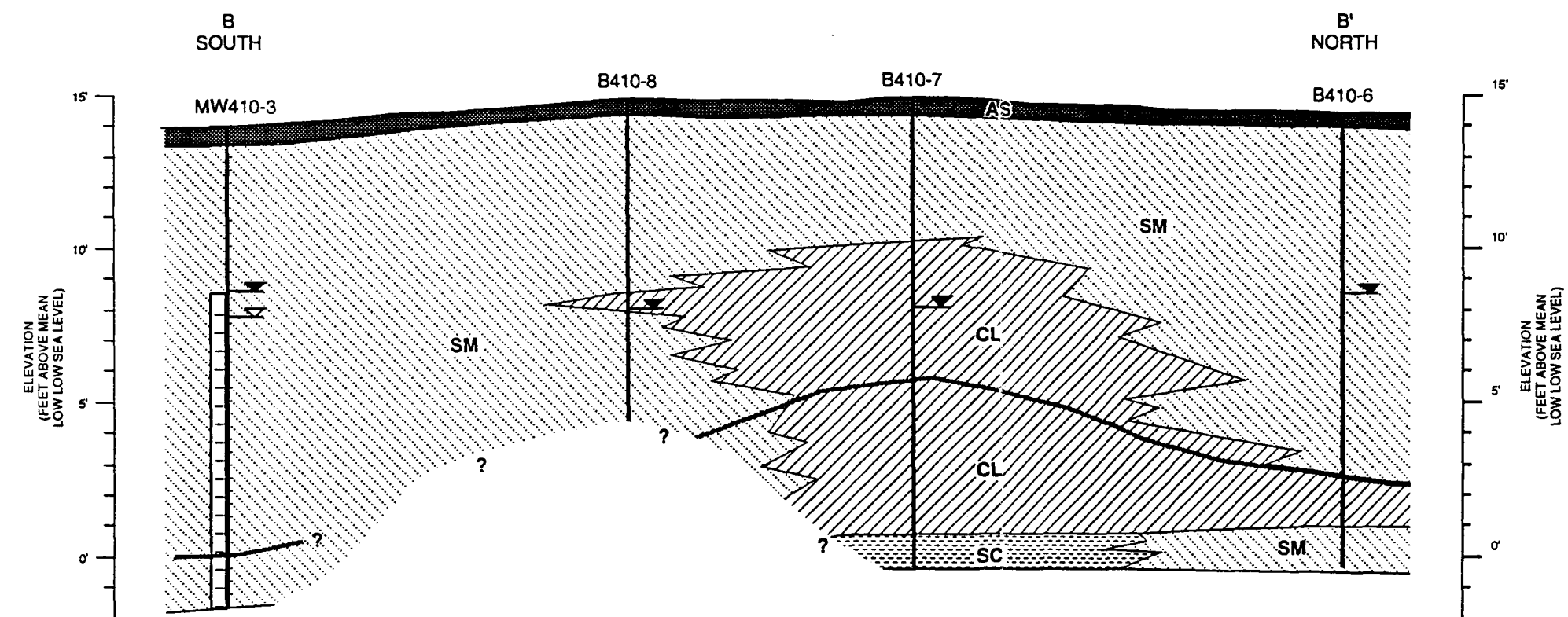
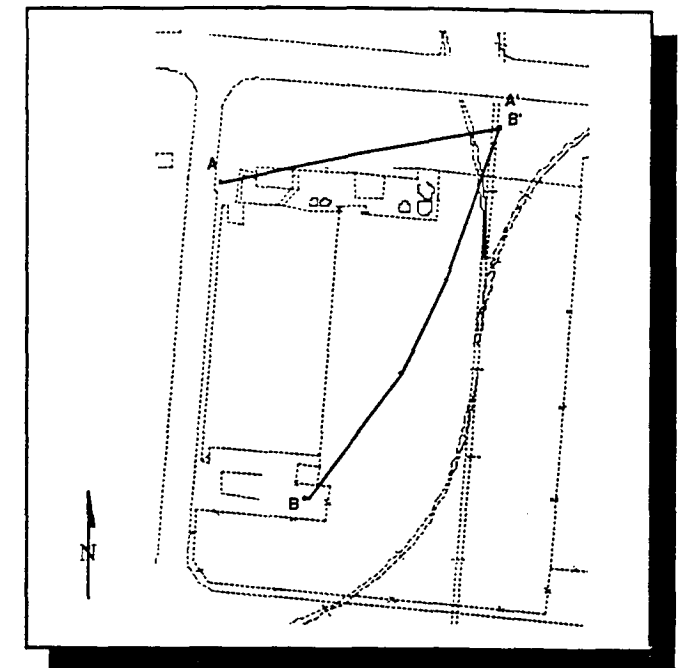
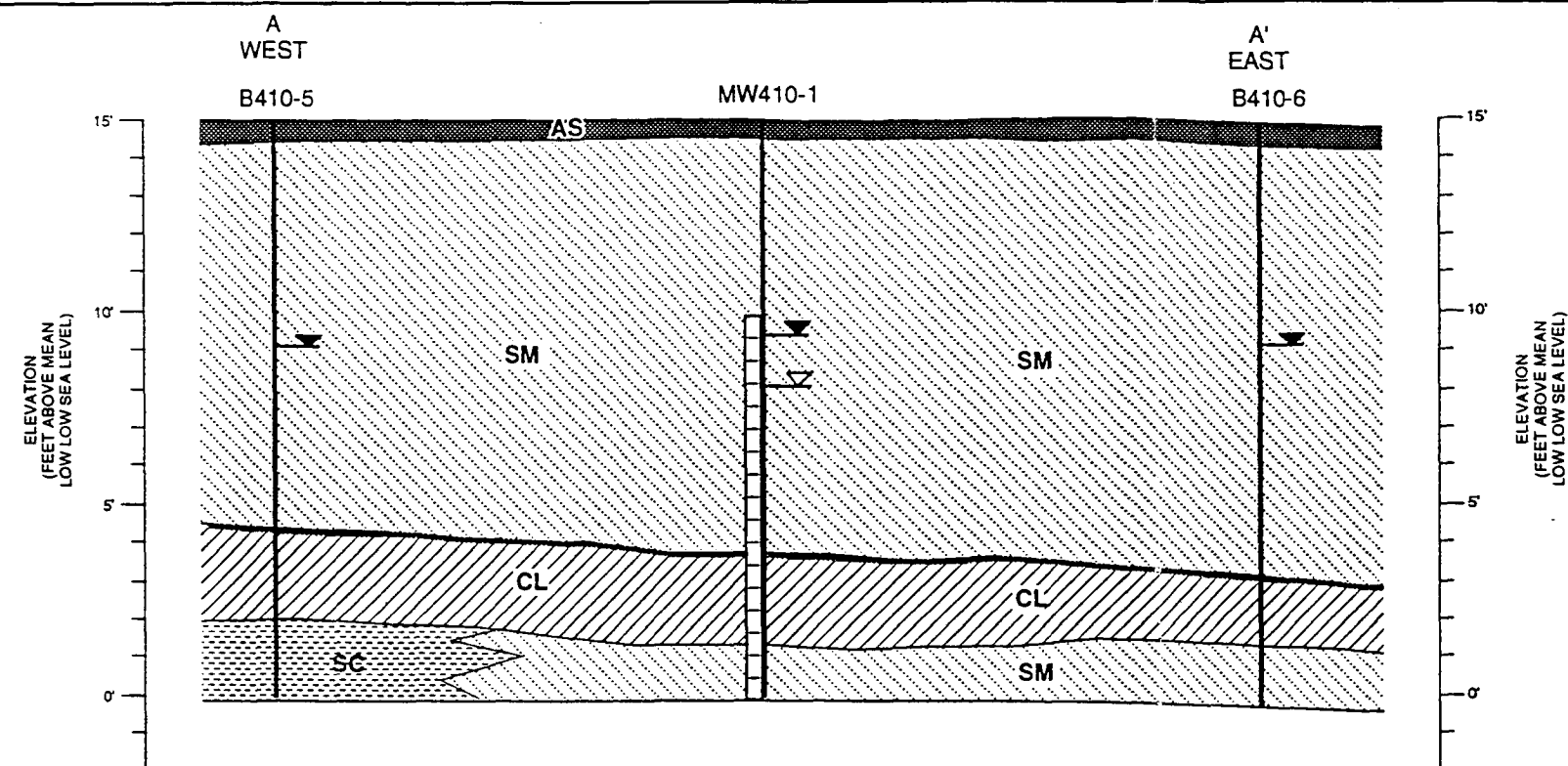
- Canonie Boring Location
- ⊙ Canonie Monitoring Well Location
- * Fence
- Sanitary Sewer Line
- Storm Sewer Line
- ... Industrial Waste Sewer Line (approximate)
- ⊕ Railroad
- Manhole
- Catch Basin

NOTE:

Boring and monitoring well locations were obtained from a base map provided by Canonie Environmental, Inc. The industrial waste sewer line location is also from Canonie (1990C). The individual locations were digitized onto a base map CAD file provided by NAS Alameda.

NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
SITE 9 - BUILDING 410,
PAINT STRIPPING BUILDING
CANONIE BORING AND
MONITORING WELL LOCATIONS

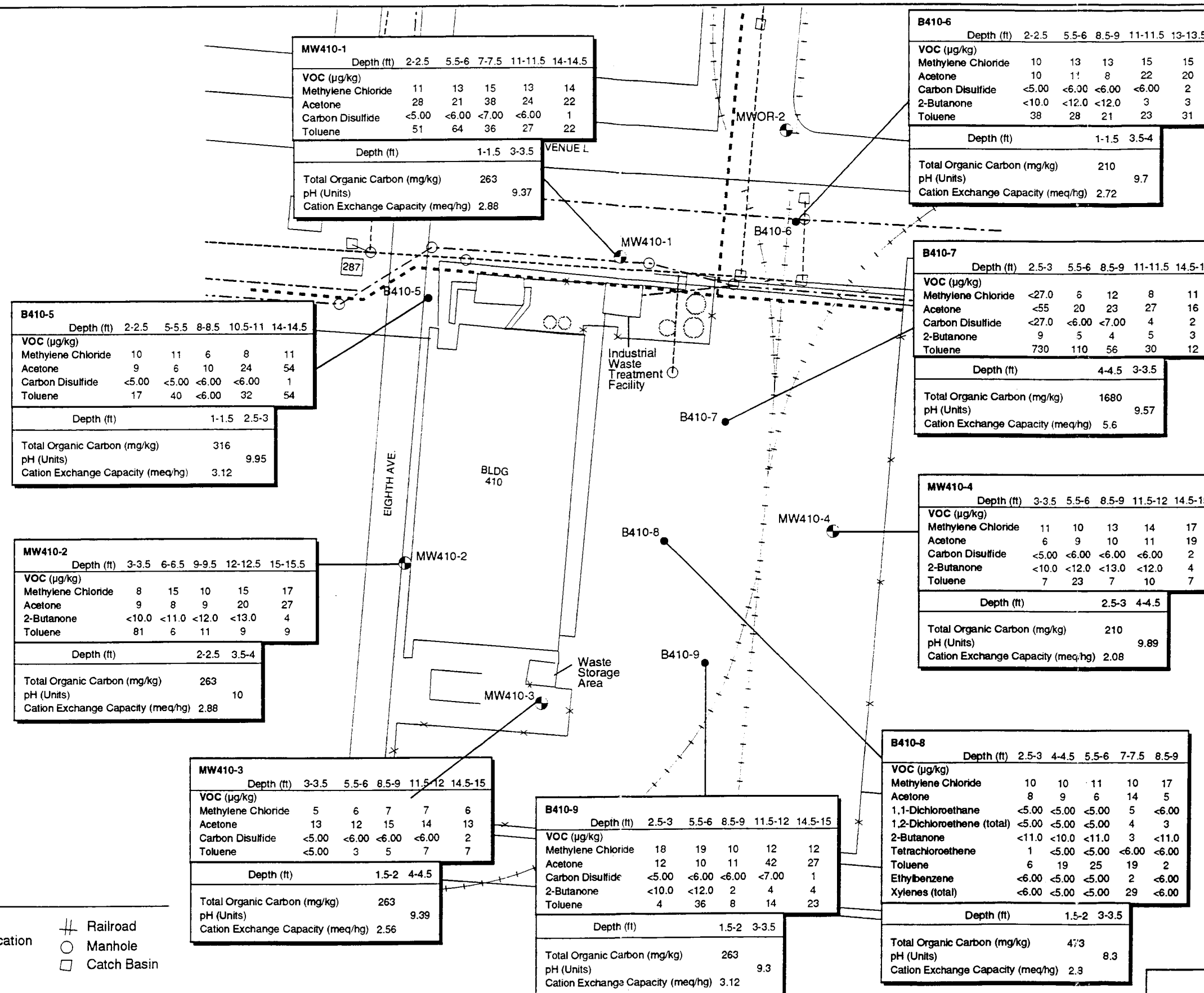
FIGURE 10-1



- LEGEND:
- | | | | |
|------------------|----------------|--|-------------------|
| GP Gravelly Sand | SC Clayey Sand | Approximate Fill/Native Sediment Interface | Monitoring Well |
| SP Sand | CL Clay | Water Level During Water Sampling | Screened Interval |
| SM Silty Sand | AS Asphalt | First Water During Drilling | |

This cross section is based on logs of wells and borings drilled and logged by Canonie Environmental, Inc. All water levels were measured by Canonie Environmental, Inc.

NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
SITE 9 - BUILDING 410,
PAINT STRIPPING BUILDING
GEOLOGIC CROSS SECTION A-A', B-B'
FIGURE 10-2

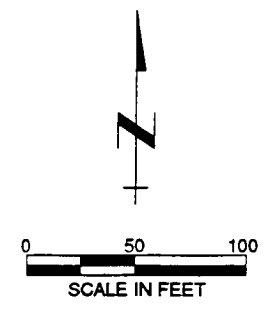


LEGEND:

- Canone Boring Location
- ⊕ Canone Monitoring Well Location
- ✕ Fence
- Sanitary Sewer Line
- Storm Sewer Line
- - - Industrial Waste Sewer Line (approximate)
- ⊥ Railroad
- Manhole
- Catch Basin

NOTES:
Boring and monitoring well locations were obtained from a base map provided by Canone Environmental, Inc. The industrial waste sewer line location is also from Canone (1990C). The individual locations were digitized onto a base map CAD file provided by NAS Alameda.

All data shown on figures is from the Canone investigation and reflects detections only.
At present, data has not been independently validated, and laboratory qualifiers are not shown.



NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
SITE 9 - BUILDING 410,
PAINT STRIPPING BUILDING
VOLATILE ORGANIC COMPOUNDS, pH, CEC,
AND TOTAL ORGANIC CARBON IN SOIL

FIGURE 10-3

MW410-1 (µg/kg) Depth (ft)	0.5-1	2-2.5	5.5-6	7-7.5	11-11.5	11.5-12	14-14.5
Naphthalene	<340	35	<380	<960	<420	<1000	<860
Diethylphthalate	<340	<350	<380	<960	85	<1000	<860
N-Nitroso-di-phenylamine	54	<350	43	120	52	<1000	<860
Phenanthrene	<340	260	<380	<960	<420	130	<860
Fluoranthene	<340	460	<380	<960	<420	180	290
Pyrene	<340	560	<380	<960	<420	450	650
Benzo(a)anthracene	<340	170	<380	<960	<420	110	160
Chrysene	<340	200	<380	<960	<420	140	180
bis(2-Ethylhexyl)phthalate	57	90	220	140	66	140	160
Benzo(b)fluoranthene	<340	230	<380	<960	<420	230	<860
Benzo(k)fluoranthene	<340	100	<380	<960	<420	<1000	<860
Benzo(a)pyrene	<340	140	<380	<960	<420	210	310
Indeno(1,2,3-cd)pyrene	<340	430	<380	<960	<420	<1000	<860
Benzo(g,h,i)perylene	<340	140	<380	<960	<420	<1000	<860

B410-5 (µg/kg) Depth (ft)	0.5-1	2-2.5	5.5-5	8-8.5	10.5-11	14-14.5	B410-5R 11-11.5
Phenol	<340	<340	42	<390	<400	<850	<570
Naphthalene	<340	<340	36	<390	<400	<850	<570
4-Chloro-3-methylphenol	<340	<340	43	<390	<400	<850	<570
N-Nitroso-di-phenylamine	42	45	59	55	50	96	85
Di-n-butylphthalate	<340	<340	42	<390	<400	<850	<570
Pyrene	<340	<340	<350	<390	<400	95	85
bis(2-Ethylhexyl)phthalate	<340	35	47	47	47	<850	<570
Benzo(b)fluoranthene	<340	<340	<350	<390	<400	85	<570

MW410-2 (µg/kg) Depth (ft)	6-6.5	9-9.5	12-12.5	15-15.5
N-Nitroso-di-phenylamine	47	64	60	<420
Fluoranthene	<350	<410	<410	270
Pyrene	<350	<410	<410	430
Benzo(a)anthracene	<350	<410	<410	73
Chrysene	<350	<410	<410	83
bis(2-Ethylhexyl)phthalate	<350	<410	<410	77
Benzo(b)fluoranthene	<350	<410	<410	150
Benzo(k)fluoranthene	<350	<410	<410	58
Benzo(a)pyrene	<350	<410	<410	170
Indeno(1,2,3-cd)pyrene	<350	<410	<410	130

MW410-3 (µg/kg) Depth (ft)	1-1.5	8.5-9	14.5-15
Phenanthrene	<700	<400	82
Fluoranthene	<700	<400	110
Pyrene	<700	<400	220
bis(2-Ethylhexyl)phthalate	98	48	<410
Benzo(b)fluoranthene	<700	<400	81
Benzo(k)fluoranthene	<700	<400	170
Benzo(a)pyrene	<700	<400	180
Indeno(1,2,3-cd)pyrene	<700	<400	140
Benzo(g,h,i)perylene	<700	<400	190

B410-9 (µg/kg) Depth (ft)	1-1.5	5.5-6	14.5-15
2-Methylnaphthalene	320	<390	<450
Phenanthrene	<670	<390	170
Anthracene	<670	<390	59
Fluoranthene	<670	<390	290
Pyrene	<670	<390	420
Benzo(a)anthracene	<670	<390	110
Chrysene	72	<390	140
bis(2-Ethylhexyl)phthalate	<670	48	<450
Benzo(b)fluoranthene	<670	<390	220
Benzo(a)pyrene	<670	<390	270

B410-8 (µg/kg) Depth (ft)	2.5-3	4-4.5	5.5-6	7-7.5	8.5-9
N-Nitroso-di-phenylamine	<720	38	59	58	56
bis(2-Ethylhexyl)phthalate	200	59	59	65	45

B410-6 (µg/kg) Depth (ft)	0.5-1	2-2.5	5.5-6	8.5-9	11-11.5	11.5-12	13-13.5
Naphthalene	<690	<340	40	<400	<410	110	<840
Diethylphthalate	<690	49	<390	<400	<410	<1100	<840
N-Nitroso-di-phenylamine	85	<340	69	65	<410	<1100	130
Pentachlorophenol	<3300	<1600	<1900	<2000	<2000	930	<4100
Phenanthrene	<690	<340	<390	<400	<410	140	91
Di-n-butylphthalate	<690	<340	45	<400	44	<1100	<840
Fluoranthene	<690	<340	<390	<400	<410	320	160
Pyrene	<690	<340	<390	<400	48	640	250
Benzo(a)anthracene	<690	<340	<390	<400	<410	180	98
Chrysene	<690	<340	<390	<400	<410	200	110
bis(2-Ethylhexyl)phthalate	110	50	68	80	76	1000	99
Benzo(b)fluoranthene	<690	<340	<390	<400	<410	400	360
Benzo(k)fluoranthene	<690	<340	<390	<400	<410	<1100	120
Benzo(a)pyrene	<690	<340	<390	<400	<410	290	260
Indeno(1,2,3-cd)pyrene	<690	<340	<390	<400	<410	<1100	290
Benzo(g,h,i)perylene	<690	<340	<390	<400	<410	430	330

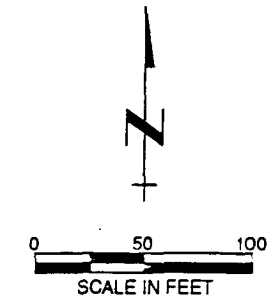
B410-7 (µg/kg) Depth (ft)	2.5-3	5.5-6	8.5-9	11-11.5	14.5-15
Acenaphthylene	<730	<420	<460	<470	130
Acenaphthene	<730	<420	<460	<470	46
Fluorene	<730	<420	<460	<470	100
Pentachlorophenol	430	<2000	<2300	<2300	<2000
Phenanthrene	<730	<420	<460	<470	1600
Anthracene	<730	<420	<460	<470	390
Fluoranthene	<730	150	95	100	2000
Pyrene	95	290	690	940	2500
Benzo(a)anthracene	<730	64	<460	<470	1000
Chrysene	<730	69	80	100	1300
bis(2-Ethylhexyl)phthalate	<730	57	160	<470	<410
Benzo(b)fluoranthene	<730	66	140	400	760
Benzo(k)fluoranthene	<730	140	250	<470	1100
Benzo(a)pyrene	<730	140	270	310	1300
Indeno(1,2,3-cd)pyrene	<730	120	230	<470	930
Dibenz(a,h)anthracene	<730	<420	<460	<470	230
Benzo(g,h,i)perylene	<730	170	260	<470	950

MW410-4 (µg/kg) Depth (ft)	11.5-12	14.5-15
Phenanthrene	<400	120
Fluoranthene	<400	200
Pyrene	<400	320
Benzo(a)anthracene	<400	86
Chrysene	<400	120
bis(2-Ethylhexyl)phthalate	52	51
Benzo(b)fluoranthene	<400	130
Benzo(k)fluoranthene	<400	210
Benzo(a)pyrene	<400	240
Indeno(1,2,3-cd)pyrene	<400	200
Benzo(g,h,i)perylene	<400	250

- LEGEND:**
- Canolie Boring Location
 - ⊙ Canolie Monitoring Well Location
 - ✕ Fence
 - Sanitary Sewer Line
 - Storm Sewer Line
 - - - Industrial Waste Sewer Line (approximate)
 - ⊕ Railroad
 - Manhole
 - Catch Basin

NOTES:
 Boring and monitoring well locations were obtained from a base map provided by Canolie Environmental, Inc. The industrial waste sewer line location is also from Canolie (1990C). The individual locations were digitized onto a base map CAD file provided by NAS Alameda.

All data shown on figures is from the Canolie investigation and reflects detections only. At present, data has not been independently validated, and laboratory qualifiers are not shown.



NAVAL AIR STATION ALAMEDA
 ALAMEDA, CALIFORNIA
 SITE 9 - BUILDING 410,
 PAINT STRIPPING BUILDING
 SEMIVOLATILE ORGANIC COMPOUNDS
 IN SOIL

FIGURE 10-4

FIGURE 10-5
SITE 9 – VOLATILE ORGANIC COMPOUNDS AND
METALS IN GROUNDWATER

FINAL DATA SUMMARY REPORT RI/FS
PHASE 1 AND 2A, VOLUME I

THE ABOVE IDENTIFIED FIGURE
IS NOT AVAILABLE.

EXTENSIVE RESEARCH WAS PERFORMED BY
SOUTHWEST DIVISION TO LOCATE THIS FIGURE.
THIS PAGE HAS BEEN INSERTED AS A
PLACEHOLDER AND WILL BE REPLACED
SHOULD THE MISSING ITEM BE LOCATED.

QUESTIONS MAY BE DIRECTED TO:

DIANE C. SILVA
RECORDS MANAGEMENT SPECIALIST
SOUTHWEST
NAVAL FACILITIES ENGINEERING COMMAND
1220 PACIFIC HIGHWAY
SAN DIEGO, CA 92132

TELEPHONE: (619) 532-3676

**FIGURE 10-6
SITE 9 – GENERAL CHEMICAL
CHARACTERISTICS OF GROUNDWATER**

**FINAL DATA SUMMARY REPORT RI/FS
PHASE 1 AND 2A, VOLUME I**

**THE ABOVE IDENTIFIED FIGURE
IS NOT AVAILABLE.**

**EXTENSIVE RESEARCH WAS PERFORMED BY
SOUTHWEST DIVISION TO LOCATE THIS FIGURE.
THIS PAGE HAS BEEN INSERTED AS A
PLACEHOLDER AND WILL BE REPLACED
SHOULD THE MISSING ITEM BE LOCATED.**

QUESTIONS MAY BE DIRECTED TO:

**DIANE C. SILVA
RECORDS MANAGEMENT SPECIALIST
SOUTHWEST
NAVAL FACILITIES ENGINEERING COMMAND
1220 PACIFIC HIGHWAY
SAN DIEGO, CA 92132**

TELEPHONE: (619) 532-3676